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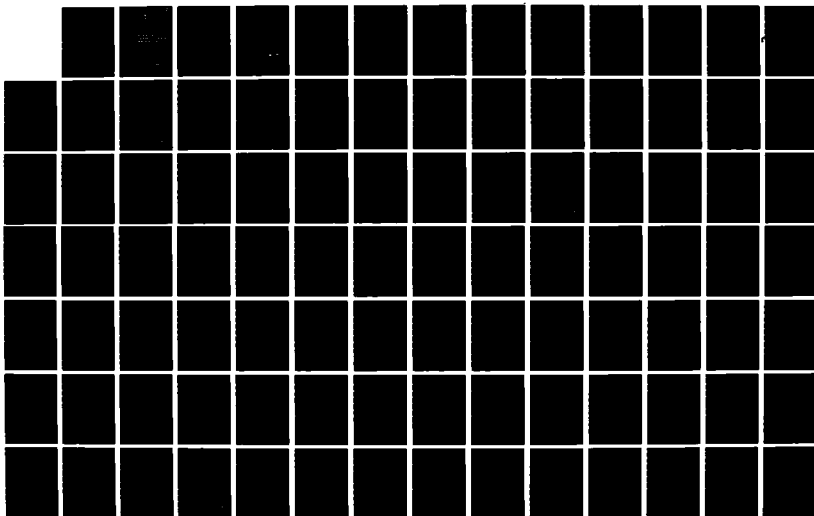
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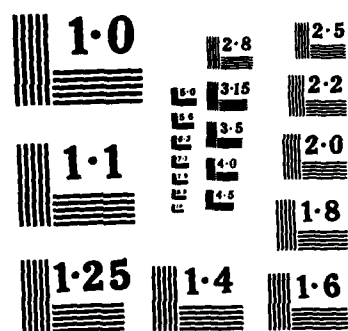
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March 1985

United States Air Force
Personnel Force Composition Study:

An Analysis of the Effects of Varying Male and Female Force Levels

ANNEX THREE:

The Prospects for Military Enlistments: An Assessment

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prepared for the
USAF Special Study Team
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United States Air Force

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FINAL REPORT - VOLUME III

**THE PROSPECTS FOR
MILITARY ENLISTMENTS:
AN ASSESSMENT**

FEBRUARY 11, 1985

FOR SUBMISSION TO:

**AF/MPZ SPECIAL STUDY TEAM
THE PENTAGON
WASHINGTON, D.C. 20330-5060**

SYLLOGISTICS, INC.

**5413 Backlick Road, Unit E
Springfield, Virginia 22151**

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PREFACE

This report is an assessment of the prospects for military enlistment contracts in the context of the declining youth population size that began in the late 1970s and will continue through the early 1990s. It represents part of a larger effort headed by Syllogistics, Inc. Our research was supported by the Special Study Team of the United States Air Force through a contract to Syllogistics, Inc. (Contract Number F49642-84-C0088). We gratefully acknowledge the support of the Air Force Special Study Team members, and Syllogistics, Inc. Valuable comments and assistance were provided by Colonel Douglas A. Patterson, Captain Daniel L. Burkett II, Lieutenant Colonel James A. Hoskins, and Major James M. Norris.

A number of the professional staff of Unicon Research Corporation contributed to the completion of the report. The primary authors are George Borjas, Robert Cotterman, John Raisian, Michael P. Ward, and Finis Welch. The authors acknowledge the comments and assistance of our Unicon colleagues: Julie deMayo, Robert Follett, Michelle Lee, Audrey Light, Iva MacLennan, Cathy Martin, and Melanie Sterling.

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EXECUTIVE SUMMARY

The purpose of this report is to examine the impacts of labor market trends on youth employment opportunities and military enlistments, and to review the determinants of enlistment contracts and related methodological issues. During the period 1979-1984, the number of military enlistment contracts that were high school graduates scoring relatively high in the Armed Forces Qualifications Test nearly doubled. This observation was very much contrary to predictions by many analysts in 1979 that these contracts would fall by as much as ten percent by 1984 and continue falling throughout the 1980s because of a declining size of the youth population that began in the late 1970s. Because 1979 represented a low point in military enlistment success, the projected future reductions raised doubts in the minds of many about the viability of a volunteer military.

Once again, some analysts are projecting that the volunteer military is not assured of survival despite its success during the past five years. These analysts attribute this success solely to military pay raises, intensified recruiting efforts, and depressed civilian labor market opportunities that more than compensated for the reduction in the size of the youth population. Since the size of the youth cohort will continue to decline for approximately eight more years and the economy is now rapidly recovering from its depressed state during 1980-1982, there are again calls for either a reconsideration of peacetime con-

scription or dramatic changes in military manpower policies designed to relieve pressures on the need for male recruits.

There are numerous statistical models that have been developed to identify the determinants of military enlistments and to project the future course of enlistment contracts. Three of these models are reviewed in this study, that are representative in terms of the kinds of models that have been developed and of the magnitudes of the estimates produced. Each of the models (two for the Air Force and one for the Army) is found to underpredict the number of enlistment contracts secured by the Air Force and Army between 1979 and 1984, suggesting that the models are potentially not capturing all of the determinants affecting the enlistment process.

We have identified other potential factors that could impact recruitment success in the coming years--most related to general labor market trends. Aside from the decline in the size of the youth population, the following trends are occurring: (1) female labor force participation rates are rising, (2) immigration rates are rising (legal and illegal), (3) the number of participants in federal job training programs is declining, (4) schooling enrollment rates of young men are declining, and (5) older workers are withdrawing from the labor market at earlier ages. Also, the issue of changing technology and changing attitudes of youth are considered.

Labor market trends can affect youth if they are substitutes or complements for workers that are part of these observed factors. For example, research results indicate that women and youth are economic substi-

tutes, meaning that the increase in the number of women in the labor market adversely impacts youth wages and unemployment. These resultant conditions benefit the military's prospects for recruitment. Taken together, these observed trends are expected to substantially mitigate the effect of the declining size of the youth cohort.

Two time paths for enlistment contracts of high school graduates with relatively high test scores are generated for the period 1984 to 1993, the year that the size of the youth population ages 17-21 reaches a minimum. One time path uses statistical model estimates but ignores the mitigating trend factors; the other time path allows for an impact of the mitigating trend factors. Both time paths take into consideration the expected future declines in the unemployment rate and the size of the youth cohort; neither time path attempts to predict changes in military policy variables such as the military wage relative to civilian wages and the size of the recruiting force--policy variables such as these are held constant at their 1984 levels. Our lowest projection for 1993 (using the first time path) calls for a ten percent decline in contracts for the Air Force and a 17 percent decline for the Army, approximately equivalent to 1982 recruitment levels. Our high projection for 1993 (using the second time path) calls for a three percent rise in Air Force contracts for this quality classification, and only a one percent decline in Army contracts.

In our view, the outlook for the volunteer military is not bleak, but bright. Even if some declines occur in the recruitment of quality youth in the coming years, the outcome will not approach the conditions ex-

perienced in 1979. Even our lowest projection for 1993 puts enlistment contracts of high-scoring high school graduates at a level that is 37 percent above the 1979 level for the Air Force, and more than double the 1979 level for the Army.

The report concludes with an evaluation of enlistment model methodologies. Precise estimates of the effects of enlistment determinants are crucial for projecting the future course of enlistment contracts. We offer some perspectives on future methodological development in the following areas: model structure and robustness; the use of time-series versus cross-section data; model specification and functional form; aggregation, asymmetry and saturation issues; labor market barometers and cyclical disturbances; and general contraction of determinant variables.

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Section 1

INTRODUCTION

By 1979, the number of male high school graduates entering the military for the first time had fallen dramatically relative to the 1975 level. While 243,000 of these young men had entered the military in 1975, only 191,000 entered in 1979--a drop of 21.4 percent (Hunter and Nelson, 1982). At the same time, the youth population grew by almost four percent to yield a fall in the enlistment rate (accessions divided by youth population) of about 25 percent. During this period, youth unemployment declined significantly, military pay fell relative to civilian pay, and educational benefits to military personnel were reduced. Hunter and Nelson (1982) attribute most of the enlistment decline of high school graduates to these factors. However, this period also saw a decline in military demand for nonprior service personnel. A decrease in the availability of desirable jobs in the military may have made it harder to attract high school graduate recruits.¹

With the advent of declining youth population cohorts in 1979--a decline that is projected to continue into the early 1990s--many analysts were pessimistic about the viability of an all-volunteer military. Enlistments of male high school graduates were projected to decline steadily throughout the 1980s (see, e.g., Fernandez, 1979). These project-

¹ Hunter and Nelson (1982) discount this hypothesis for the decline in accessions of high school graduates.

the elasticity of contracts with respect to youth population be unity, holding constant the remaining explanatory variables. The unconstrained population elasticity estimates of Table 4 indicate that they are substantially less than unity. The significance of this result is that as youth population size diminishes during the remainder of the 1980s, contracts will be less than proportionately impacted.

TABLE 4

Selected Elasticity Estimates from the Goldberg-Greenston Model*

Variable	High School Graduate Contracts	
	CAT I-II	CAT I-IIIA
Relative Wage	.46	.65
Unemployment Ratio	.82	.83
Unemployment Rate	.32	.34
Air Force Recruiters	.86	.80
Goals Per Recruiter	.58	.63
Youth Population Size	.22	.31

* Each entry measures the percentage change in contracts associated with a one percent change in the variable under consideration, holding all other variables constant.

Source: Goldberg-Greenston (1984).

This interpretation can be misleading, however. Other models specify the contracts to population ratio as a function of the usual determinants, including the recruiter to population ratio. One can rearrange the terms in such specifications and have contracts depending upon popu-

build a structural model (as in the DeVany-Saving case), or concentrate on high quality enlistments (thought to be relatively more supply determined) and purge years where demand influences are believed to be especially strong. For this reason the period of analysis is restricted to 1978-1981.

The analysis utilizes cross-section data for each of the four years; data are disaggregated according to 35 recruiting districts. In this model, the actual number of Air Force contracts (rather than the contract rate) is specified to depend on the following factors:

- (1) the military wage divided by the civilian wage,
- (2) two unemployment variables, the first being the unemployment rate divided by its five-year regional average and the second being the five-year average by itself,
- (3) the number of Air Force recruiters,
- (4) total recruitment goals per recruiter,
- (5) the male youth population ages 17-21,
- (6) the percentage of the population residing in urban areas, and
- (7) a youth quality variable (for each region, but constant over time) measured as the percentage of youth that were classified in AFQT categories I-III A (from the Profile of American Youth).

Selected elasticity estimates for male enlistees are presented in Table 4. A unique feature of this model is that the enlistment variable is the number of contracts rather than the contract rate (i.e., contracts divided by youth population size). However, youth population size is entered as a separate determinant in the model. The general practice of using the contract rate causes an implicit constraint that

TABLE 3

Selected Elasticity Estimates from the DeVany-Saving Model*

Determinant Variable	Endogenous Variable			
	Quality Ratio	Wait Time	Contract Rate (reduced form)	Contract Rate (structural)
Relative Wage	0.5	3.9	-0.5	1.6
Employment Rate	0.6	-1.1	-2.3	-1.6
Unemployment Rate**	-0.06	0.10	0.22	0.15
Recruiter Ratio	1.1	1.0	-1.7	
Enlistment Ceiling	-1.5	-5.1	3.7	
Quality Ratio				-1.2
Wait Time				-0.4

* Each entry measures the percentage change in the endogenous variable associated with a one percent change in the determinant variable under consideration, holding all other variables constant.

** The unemployment rate elasticities are calculated as the negative of the employment rate elasticities times the ratio of the unemployment rate to the employment rate.

Source: DeVany and Saving (1982).

2.3 THE GOLDBERG-GREENSTON MODEL

Lawrence Goldberg, Peter Greenston, and associates (1984) set out to analyze enlistment behavior for the period 1978-1982. However, they generally omit 1982 data from their estimates, claiming that enlistments (even high quality enlistments) were largely demand-determined in that year. In order to focus on enlistment supply behavior, one can either

Selected elasticity estimates are presented in Table 3. There are two contract rate specifications, one labelled "reduced form" and the other labelled "structural." The former specification is akin to the commonly used enlistment specification. The results show that the elasticity of the contract rate with respect to the relative wage is negative; that is, as military wages rise, fewer contracts are obtained. This result is usually interpreted as a demand-driven result. The wage elasticity from the structural specification, however, is positive and of sizable magnitude; a greater military wage induces a greater number of contracts, holding other factors constant (including quality and wait time).

the period 1969 to 1976.⁸ The model has three jointly dependent or endogenous variables: (1) mean wait time from contract to accession, (2) the ratio of CAT I-II enlistees to CAT III-IV enlistees, and (3) the ratio of total Air Force contracts to male population ages 16-19. The exogenous determinants include (1) military wages divided by civilian wages, (2) the employment rate of male teens (i.e., one minus the unemployment rate), (3) the ratio of Air Force recruiters to the number of recruiters for all service branches, (4) the manpower enlistment ceiling, (5) the probability of conscription, and (6) quarterly indicator variables.

The model is a recursive one in which the first stage specifies that the quality ratio and wait time depend on all of the six exogenous factors. The enlistment rate is then specified to depend on (1) the quality ratio (purged of simultaneity bias), (2) wait time (also purged of simultaneity bias), (3) the relative wage, (4) the employment rate, (5) the conscription variable, and (6) the quarterly indicator variables. Thus, the model has an explicit structure with which to trace the effects of exogenous changes. For example, a change in the enlistment ceiling is modelled to affect the quality ratio and wait time which, in turn, affect the enlistment rate. The structural enlistment rate specification maps out a supply-oriented equation.

⁸ This period overlaps with the draft. The authors attempt to control for conscription by adding an exogenous determinant to their analysis--namely, a measure of the probability of being drafted.

TABLE 2

Attitudes About the Military: Male High School Seniors, 1976-1982

(percent of respondents who answered affirmatively)

Year	Plan to Serve in Armed Forces	Would choose to Serve in Armed Forces Abstracting From Other Circumstances	Rated Military Service as an Acceptable or Desirable Career Beginning	Feel that Military is Doing a Good Job	Feel that U.S. is Spending Too Little On Armed Services
1976	22.0	19.7	33.4	58.4	34.5
1977	19.0	17.9	28.4	53.5	34.1
1978	18.7	18.3	28.0	58.1	38.3
1979	17.6	15.5	26.1	45.5	40.6
1980	21.0	16.6	24.6	38.2	56.9
1981	23.4	19.2	30.5	43.3	58.7
1982	24.1	19.7	29.7	52.5	37.5

Source: Institute for Social Research (see Bachman, 1983).

2.2 THE DEVANY-SAVING MODEL

Arthur DeVany and Thomas Saving (1982) propose a structural model for analyzing the determinants of Air Force enlistments. Whereas Brown estimates statistical relationships for different quality level aggregations and assesses whether supply or demand effects are dominating, DeVany and Saving attempt to model structurally the supply and demand phenomena. Their model is applied to monthly time-series data covering

military is doing a good job declined through 1980 but has risen since then. Finally, the period 1976-1981 saw an increase in the percentage of youth who believe the country is spending too little on the Armed Services, although this percentage fell substantially in 1982. This indication of attitudes toward military spending is similar to that found in a National Opinion Research Center survey of youth and adults. The percentage of respondents who thought too little was being spent on the military rose during 1973-80 and then fell dramatically during 1982-83 (perhaps reflecting satisfaction that increased spending in the early 1980s was alleviating perceived problems). Taken together, these indicators suggest that attitudes of youth toward the military are becoming more positive and are possibly contributing to an increased enlistment rate among youth.

Trend terms, however, can proxy a multitude of other effects as well. We will investigate the possibility that other general labor market trends may be influencing the enlistment rate over time. For example, the pronounced and rapid rise of women's participation in the labor market may have impacted the youth labor market in a way that would induce more youth to turn to military service. The potential effects of these kinds of trends are addressed in following sections.

found to be more cyclically sensitive and more responsive to increased recruiting effort than that of all enlistees taken together. Brown's estimates also suggest that if the relative number of recruiters increases for service branches other than the Army, it detracts from the Army's recruitment of high quality enlistees.

The most interesting and unique result in Table 1 is that the high quality enlistment rate was rising between 1.2 and 1.8 percent per year over the sample period 1975-1982, holding constant the aforementioned factors. This result is extremely significant, particularly if one is forecasting several years into the future. For example, extrapolating ten years into the future would yield a 15 percent increase in the enlistment rate from this effect alone. What is the underlying cause of this growth factor? One answer is that it proxies a trend of excluded factors not being considered in the model. We explicitly raise a number of such factors in this report relating to the effects labor market trends on the youth labor market and enlistment contracts. Another explanation relates to the attitudes of youth toward military service.

A survey of youth attitudes toward military service was conducted between 1976 and 1982, and involved a nationally representative sample of high school seniors (Bachman, 1983). Some of the findings for males are presented in Table 2. Preferences for military service by male youth (as indicated by their plans to serve) fell between 1976 and 1979 but rebounded during the period 1979-82. The percentage of youth that rated military service as an acceptable or desirable career initiation fell through 1980 but rose afterwards. The percentage of youth who think the

TABLE 1

Selected Elasticity Estimates from the Brown Model*

Variable	CAT I-III A HSG Contract Rate		Total Contract Rate	
	Specification		Specification	
	(a)	(b)	(a)	(b)
Relative Wage	.64	.97	-1.59	-2.00
Unemployment Rate	.83	.69	.33	.31
Army Recruiter	.29	.89	.02	-.07
DOD Recruiter		-.32		.35
National Advertising		.05		.12
Local Advertising		-.05		-.05
Time Trend**	1.8	1.2	-0.9	-1.6

* Each entry measures the percentage change in the enlistment rate associated with a one percent change in the variable under consideration, holding all other variables constant.

** The time trend variable is not an elasticity but instead measures the annual percentage change in the enlistment rate, holding all other variables constant.

Source: Brown (1983)

total contracts. This point is supported by Brown's estimates. As the military wage is increased, the enlistment rate among CAT I-III A HSGs rises, while the overall enlistment rate falls. That is, greater relative numbers of high quality enlistees are induced to enter military service, and fewer relative numbers of lower quality enlistees are chosen. Furthermore, the enlistment rate of high quality enlistees is

youth population) is specified to depend upon

- (1) the military wage deflated by civilian wages,
- (2) the unemployment rate,
- (3) the number of Army recruiters deflated by the appropriate youth population magnitude,
- (4) a measure of educational benefits provided by the military,
- (5) a time trend variable,
- (6) the number of recruiters for all service branches deflated by the relevant population size,
- (7) the amount of national advertising expenditure divided by the relevant population size, and
- (8) the amount of local advertising expenditure divided by the relevant population size.

Selected elasticity estimates are presented in Table 1.⁷ We present estimates for only two groups: all contracts combined, and HSG contracts with scores in categories I-III A. Focusing first on the latter group, one finds that the Army enlistment rate of high quality enlistees increases as the military wage increases (relative to the civilian wage), as the unemployment rate increases, and as the Army recruiter variable increases. Thus, the enlistment rate is countercyclical and can be influenced by military policy variables--namely, the military wage and the relative number of recruiters in the field.

These estimates are in contrast to those for contracts as a whole. A contention that pervades the enlistment model literature is that high quality contracts are more heavily influenced by supply factors than are

⁷ In this instance, an elasticity is a measure of the percentage change in the enlistment rate associated with a one percent change in the variable under consideration (e.g., the relative wage measure).

els' goal is usually to identify the determinants of enlistment behavior and measure their impact, a measure of enlistment contracts is the appropriate variable. Also, most models focus on the analysis of "high quality" enlistments. Quality is generally measured in two dimensions: one distinguishes high school graduates (HSG) from non-graduates, and the other ranks recruits according to Armed Forces Qualifications Test (AFQT) scores.⁵ Recruits are placed in one of (generally) five aptitude categories (CAT) based on their AFQT scores, labeled I, II, IIIA, IIIB, and IV, where CAT I denotes the highest aptitude category and CAT IV denotes the lowest.⁶

2.1 THE BROWN MODEL

Charles Brown (1983) analyzes the determinants of Army enlistments using cross-section, time-series data (quarterly observations by state) for the period 1975-1982. The Brown model resembles most closely other models that estimate military enlistments.

Brown produces estimates for four groups of nonprior service young men: total enlistment contracts, HSG contracts, CAT I-IIIA contracts, and contracts that are both HSGs and CAT I-IIIA. In this model, the enlistment rate (i.e., contracts divided by a measure of the appropriate

⁵ Formally, the group designated as HSG includes high school graduates with diplomas and individuals who are high school seniors when they sign an enlistment contract; individuals who have dropped out of high school or have obtained General Educational Development (GED) high school equivalency credentials constitute the non-graduate category.

⁶ There is a CAT V, but the Armed Forces are prohibited by law from conscripting any individuals with scores in this category. Accordingly, it is the policy of the Department of Defense that no CAT V volunteers be accepted for military service.

Section 2

STATISTICAL MODELS DESCRIBING ENLISTMENTS AND THEIR DETERMINANTS

In this section, we discuss three models of military enlistments, each with unique and interesting conceptual features. These three models are also representative of the types of analyses available in the current literature.² After describing these models and presenting their estimates, we turn our attention to their performance after 1979, the period of declining availability of youth for military enlistment.³

These models use "enlistments" to refer to enlistment contracts obtained from nonprior service individuals. The date of contract differs from the date of entry or accession into the service, especially for those recruits entering the delayed entry program (DEP).⁴ Since the mod-

² This holds true with one exception: models designed for observations on individual persons rather than aggregate observations over time and across regions. However, most of the micro-models are cross-sectional in nature and are not appealing for the projections that are called for in this analysis. Despite this drawback, it is not apparent that aggregation of micro-level data distorts the parameter estimates of a conceptual model. For example, if one is interested in estimating a market supply relation, it could be estimated directly using aggregate data, or it could be determined by aggregating individually estimated supply relations. It is not at all clear that one obtains different answers when comparing the two approaches.

³ Several other models could have been used in our summary presentation. However, the nature of the performances of the models chosen for our evaluation are not fundamentally different when using estimates of other modelling mechanisms.

⁴ DEP permits a person to sign an enlistment contract allowing actual entry into the service at a future date.

methodology for measuring the impact of these trends on enlistments. In Section 7, we use estimated magnitudes to illustrate the impact of labor market trends on recruitment. Finally, we assess statistical enlistment models and offer conclusions in Sections 8 and 9, respectively.

ions failed to materialize; in fact, the number of high school graduate accessions actually rose substantially during the early 1980s. Were the warnings unjustified or did unforeseen events occur to compensate for the anticipated problems? Was the declining youth cohort effect exaggerated? The two economic recessions during the early 1980s provide at least part of the explanation. But did their occurrence merely postpone inevitable recruiting hardships? Were there other factors that accounted for the relative recruitment success? What is the outlook for the remainder of the 1980s? These issues are explored in this report.

We begin, in the next section, by reviewing three representative statistical models of military enlistments. Two of these models pertain to the Air Force enlistment process; the other deals with Army enlistments, but taken together, they provide insights into the overall military situation. In Section 3, we assess the performance of all three models for the period 1979-1984. Section 4 evaluates the models' worth in making future enlistment projections.

Characteristics of the labor market facing youth are integral to our understanding of the enlistment decision. These characteristics are studied in Section 5. Furthermore, a number of general labor market trends have been observed over the past several years that potentially impact the youth labor market. We consider trends in the following areas: (1) the size of the youth population cohort (2) the role of women in the labor force, (3) immigration, (4) the role of government training programs, (5) educational enrollment, (6) changing technology, and (7) the role of workers' retirement decisions. In Section 6, we present a

lation, recruiters, and the other determinants, but it follows that there is a precise relationship between the coefficients on population and recruiters. Specifically, an unconstrained estimate of contracts as a function of population, recruiters, etc., would be equivalent to the more traditional specifications if the coefficients on population and recruiters sum to unity. For categories I-II, they sum to 1.08; for categories I-IIIA, they sum to 1.11 (see Table 4). Since these sums are not very different from unity, it appears that the traditional specifications are not suspect on this basis.

To illustrate the equivalence, suppose the youth population declines by ten percent. The Goldberg-Greenston model suggests that CAT I-IIIA contracts would fall by only three percent. In a traditional model, one is inclined to state that a ten percent decline in population implies a ten percent decline in contracts. However, a ten percent decline in population raises the recruiter to population ratio by ten percent, which by itself increases contracts. The net result is that contracts fall by less than ten percent in the traditional model as well.



Section 3

ACCOUNTING FOR CHANGES IN ENLISTMENT CONTRACTS DURING THE PERIOD 1979-1984

During the period 1979-1984, enlistment contracts of "high-quality" individuals (CAT I-III A HSGs) rose appreciably, despite the declining size of the youth population. The proportion of these nonprior service contracts relative to total contracts in all branches of the military rose from about 30 percent in 1979 to nearly 60 percent in 1984. Furthermore, this observation was valid for all of the branches separately. For example, the percentage rose from 47 percent to 77 percent in the Air Force. In the Army, traditionally thought to have the most difficulty in recruitment of CAT I-III A HSGs, the percentage rose from 20 percent to 52 percent. What changes in enlistments would the models have predicted? We first consider the Air Force models. During this period, the following changes were observed:

- (1) the military wage rose two percent relative to civilian wages,
- (2) the unemployment rate rose 29 percent,
- (3) the number of Air Force recruiters fell 20 percent,
- (4) aggregate Air Force enlistment goals fell 14 percent,
- (5) the size of the youth population (ages 17-21) fell 7.5 percent, and
- (6) the number of CAT I-III A HSG contracts rose 53 percent.

First, consider the Goldberg-Greenston model. To obtain a predicted change in enlistment contracts, one multiplies each of the observed percentage changes by the model's elasticity estimate and sums the resulting products. The model predicts an increase of CAT I-III A contracts amounting to eleven percent, far below the observed 53 percent change.⁹ The rise in the unemployment rate is by far the greatest factor accounting for the observed increase. In fact, one reason for the sizable underprediction could be related to the dramatic decline in the overall unemployment rate between 1983 and 1984; it fell from 9.6 percent to 7.5 percent. The Goldberg-Greenston model predicts a 38 percent increase in enlistment contracts (CAT I-III A HSG) during the period 1979-1983; this compares to an observed increment amounting to 45 percent. The model still underpredicts the rise in enlistments in these categories, though not to the degree of the 1979-1984 prediction. The underprediction raises an issue about whether there are underlying factors that are causing enlistment contracts to trend upward that are not being captured by this particular model.

In considering the DeVany-Saving model, we have to bring in some additional facts. CAT I-IIs as a percentage of total contracts rose from 37.8 percent in 1979 to 50.3 percent in 1984--a 33 percent increase. This raises DeVany and Saving's quality ratio 66 percent, from .61 to

⁹ If recruiting goals fell by 14 percent and the number of recruiters fell by 20 percent, it follows that the ratio of goals to recruiters rose by six percent. It is this magnitude that is multiplied by the elasticity presented in Table 4. Furthermore, there are two unemployment rate responses in this model--one measuring a general cyclical response, and the other representing more permanent regional effects. The appropriate elasticity for this exercise corresponds to the cyclical measure, or the unemployment ratio.

1.01. Does this observed increase match the change in the quality ratio predicted by the model? The youth unemployment rate rose 17 percent over the period. The ratio of Air Force to Armed Forces recruiters fell on the order of 28 percent over the period.¹⁰ Finally, extended active duty (EAD) goals fell seven percent over the period. Taken together, these changes would lead to a predicted decrease in the quality ratio of about twenty percent--far different than the observed 66 percent increase.

The total number of contracts fell 6.3 percent over the period. Given that the size of the youth population fell by 7.5 percent, the contract rate increased by 1.2 percent. The only additional information required to determine the predicted change in the contract rate is the change in mean wait times. This information is not available to us; however, using the elasticities in Table 3, we can predict an increase in wait times of 17 percent. This, along with the other information, yields a predicted decrease in the enlistment rate amounting to 80 percent--very different than the observed increase of just over one percent.

The Goldberg-Greenston model clearly performs better than the DeVany-Saving model for this time period. It is difficult to judge whether the model is better per se, or whether the DeVany-Saving estimates are no longer useful, given that they were estimated for the early 1970s. It may not be surprising that the Goldberg-Greenston model performs relatively well since it employs data for 1978-1981. We will use the esti-

¹⁰ Note that this variable is unusual because it disregards an equal proportionate increase in recruiters by all branches of the service.

mates from Goldberg-Greenston exclusively for our discussion of what the future holds for Air Force enlistments.

To evaluate the Brown model, one additional fact is pertinent: the number of Army recruiters rose by 15 percent during 1979-1984.¹¹ Estimates from Brown's model suggest that the enlistment rate should have risen by 41 percent. Given the fall in the size of the youth population of 7.5 percent, the rise in the enlistment rate is consistent with the number of enlistment contracts rising by about 34 percent. In actuality, Army enlistment contracts (CAT I-III A HSGs) more than doubled over the period, another case of clear underprediction. Moreover, this occurs despite the inclusion of the 1.8 percent annual trend term in the model.

The underprediction generated in these three models is not unique. Elasticity estimates of other models are similar to those presented here. We are not aware of other models that yield performance levels that surpass those of either Goldberg-Greenston or Brown for this period.

¹¹ Since the youth population (ages 17-21) fell by 7.5 percent, the ratio of Army recruiters to youth population rose by 22.5 percent.

Section 4

PROJECTING ENLISTMENT CONTRACTS TO 1993

Relative to 1984, two patterns are expected for the ensuing nine years: a decreasing unemployment rate and a continued decline of the youth population. Data Resources, Inc., projects a new, long-term unemployment rate to establish itself at a seven percent level by the early 1990s. This represents only a seven percent decline from the 1984 level of 7.5 percent. Furthermore, the size of the youth population cohort (ages 17-21) is expected to fall by 16 percent over the period 1984-1993. Taken together, these patterns generate a predicted decline in CAT I-III A contracts of between ten and 11 percent for the Air Force, and between one and 17 percent for the Army.¹²

In 1984, the number of Air Force contracts for high school graduates in categories I-III A was approximately 49,800, or 77 percent of all Air Force contracts.¹³ A predicted 10.5 percent decline in these contracts by 1993 would put the number at 44,600, or 69 percent of total contracts. Is this situation indicative of impending disaster? In 1979, approximately 32,500 CAT I-III A HSG contracts were secured, representing -----

¹² The reason for the wide range for the Army relates to the incorporation of the time trend term in Brown's model. If the contract rate continues to rise by 1.8 percent per year, this effect overrides the unemployment and youth population size effects and yields an expected decline in CAT I-III A HSG enlistments of only one percent.

¹³ The enlistment quality group referenced as CAT I-III A HSG includes individuals with a high school diploma as well as individuals who are seniors in high school at the time a contract is signed.

less than half of total contracts. While this was not viewed as a great year, things were projected by many to get much worse since 1979 was the year in which the youth population peaked. If the current prediction for 1993 is the lowest that can reasonably be expected, it certainly would not appear that calamity is at our doorstep. An Air Force enlistment crop that is composed of 69 percent CAT I-III A HSGs measures proportionately better than the 1982 crop, regarded as one of the best since adopting an all-volunteer military.

Similar comparisons are available for the Army as well. In 1984, the number of Army contracts for high school graduates in categories I-III A was approximately 68,900, or 52 percent of all Army enlistment contracts. Even if these contracts were to decline by as much as 17 percent over the next nine years, they would still number about 57,200, or 43 percent of total contracts. In 1979, approximately 27,600 CAT I-III A HSG contracts were secured, representing only about 20 percent of total contracts. The projected decline to a level of 57,200 is clearly superior to the 1979 level. If these models are at all accurate, there should be little question about the viability of an all-volunteer military.

Forecasting enlistment contracts nine years into the future is indeed a difficult task. It requires that events in the youth labor market be projected nine years into the future. We have observed a number of general labor market trends in the last several years, trends that are likely to continue and impact the youth labor market. We now turn our attention to the youth labor market and to the identification of these

trends. In succeeding sections, we discuss their potential impact on youth, especially on enlistment decisions.

Section 5

THE YOUTH LABOR MARKET AND THE IMPACT OF LABOR MARKET TRENDS ON YOUTH EMPLOYMENT OPPORTUNITIES

In this section, we examine some general features of the youth labor market and the impact on youth of various trends observed in the overall labor market. Our aim is to understand recent changes and the likely future course of the youth labor market. Because the military competes directly with the private sector for the labor of young people, economic, social and demographic factors that impinge on the youth labor market have immediate and important implications for the military's ability to recruit and retain personnel.

An obvious factor affecting the youth labor market--as well as other labor markets--is the level of activity in the U.S. economy. It is well known that during the upswing of a business cycle, employment and real wages rise and unemployment rates decline, while in the downswing of the cycle, the movement in these variables is reversed. Thus, it is no surprise to learn that key employment characteristics in the youth labor market have a cyclical component. How sensitive are youth employment characteristics to cyclical shifts? Recent work on youth labor markets confirms that, indeed, "youth employment is highly sensitive to cyclical movements in the economy" (Freeman and Wise, 1982, p. 8).

This sensitivity is confirmed by cross-sectional studies and by time-series analyses. In the latter research, the time-series data "show

that a one percentage point increase in the adult male unemployment rate is associated with a 5 percent decrease in the proportion of young men aged 16 to 19 who are employed" (Freeman and Wise, 1982, p. 8). This result, obtained from a study of post-war employment statistics, provides a useful "rule" for predicting what will happen to youth employment given any change in aggregate economic activity, as measured by the adult male unemployment rate. It is important to note that the magnitude reported by Freeman and Wise suggests that the youth labor market is extremely sensitive to cyclical shifts. For example, a four percentage point rise in the adult unemployment rate (such as the four to eight percent rise of the early 1980s), would lead to a 20 percent drop in the proportion of youth employed.

This result is confirmed by studies of cross-section data which try to explain the characteristics of youth employment across different regions at a given point in time. The cross-section studies show that a one percentage point increase in the adult unemployment rate leads to a decline in the youth employment rate of between two and five percent, depending on the age of the young workers.

There is another cycle of sorts that has impacted the youth labor market. Periodically, changes in minimum wage legislation in either wage levels or employment coverage affect employment opportunities for youth. Since a minimum wage of 75 cents per hour was first imposed in 1950, the minimum wage relative to the average hourly wage for production workers in manufacturing has ratcheted up by as much as 27 percent (in 1956), and has eroded by as much as 28 percent between periods of

legislation (1968-73). Studies find that a ten percent increase in the relative minimum wage reduces employment of teenagers by as much as three percent and of youth ages 20-24 by as much as one percent (see Brown, Gilroy and Kohen, 1982). A swing of 30 percent in the relative wage of teenagers translates into three quarters of a million jobs lost (if a higher minimum is imposed) or gained (if the minimum is allowed to erode).

The last time the minimum wage was increased was in 1981, to a level of \$3.35. Since that time, the minimum relative to manufacturing wage has declined 15 percent. By itself, this would increase teenage employment by as much as 4.5 percent or nearly 400,000 jobs. There appears to be no planned increase in the federal minimum in the near future; however, Congress has discussed lowering the minimum wage for youth during the summer from \$3.35 to \$2.50--a 25 percent reduction. This is expected to add to youth employment if enacted, although it is difficult to determine by how much because it applies only during the summer. Nonetheless, the youth labor market is expected to be tighter with these added employment opportunities.

A decline in the minimum wage (particularly to youth) has two opposite effects on military recruitment. On the one hand, added employment opportunities are generated causing the civilian labor market to become relatively attractive to youth. On the other hand, wages in the civilian market decline, causing military employment to become relatively attractive. Which effect dominates is strictly an empirical matter that cannot be determined a priori.

Studies generally find that members of labor force "bulges" make concessions either in wages, employment opportunities, or both. But the "bulge" can impact other labor force groups as well; i.e., members of a "bulge" can take jobs from or create jobs for other labor force members, namely youth.

The basic idea can be grasped by looking at Figure 1, which shows the familiar supply and demand curves representing the youth labor market. The curve "D" is the demand curve for youth, and its downward slope indicates that the demand for young workers increases as their wage rate declines. The curve "S" is the supply curve for youth, and its upward slope indicates that more young workers are willing to enter the civilian labor market the higher the civilian wage. The "equilibrium" wage and employment of youth are given by the intersection of the demand and supply curves (points w_0 and L_0 , respectively).

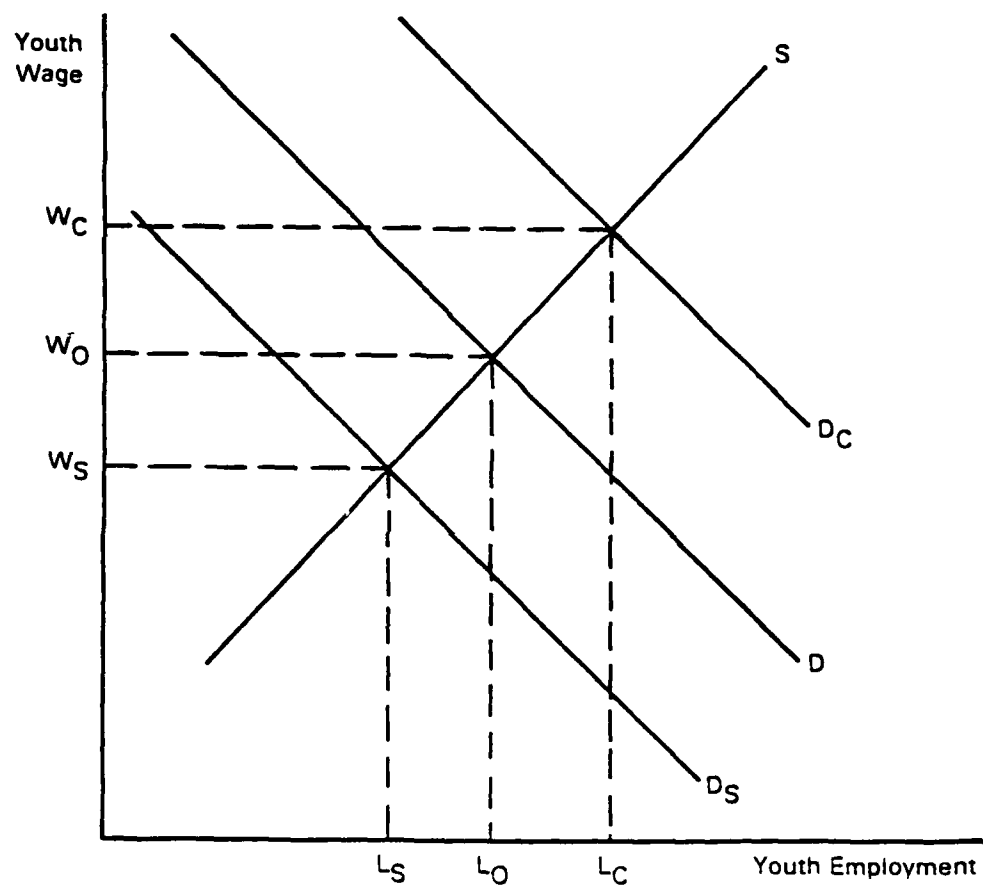


Fig. 1 — Effects of Increase in Supply of Factors That are Either Substitutes or Complements in Production

Statistics provided by the Department of Labor (Lovell, 1982) partially justify the overall results of Table 9. During the 1970s, total net (legal) immigration to the U.S. averaged 433,600 per year. Based on these historic flows, it was projected that 470,000 legal immigrants per year would enter the U.S. throughout the 1980s; a four-fold increase in emergency refugee flows could raise this figure to 650,000 per year. Since about half of these immigrants enter the labor force, they contribute 235,000 to 325,000 new workers per year, or 10 to 15 percent of total U.S. labor force growth. Table 10 compares the occupational distribution of immigrants to that of the domestic labor force. The numbers show that this group of immigrants, which is composed primarily of relatives of U.S. workers, has virtually the same distribution of skill levels as the civilian labor force. Indeed, in testimony before the Subcommittee on Immigration and Refugee Policy, Lovell states that immigrants "quite closely resemble the U.S. population and labor force, in terms of age, sex, marital status, labor force participation rates and occupation" (p. 20). Although evidence on the impact of immigrants is scarce, it appears that they are absorbed into various sectors of the labor market fairly evenly.

If there is an immigrant-induced effect on youth labor markets, it is more likely to come from illegal aliens. Unfortunately, the literature on illegal immigrants has focused mainly on developing a methodology for counting their numbers (see, for example, Fogel, 1977). Even this relatively simple task has encountered major problems due to the lack of direct data and the need to make many unverifiable assumptions about the motives for illegal immigration. The expansion of this line of research

5.3 THE IMPACT OF IMMIGRANTS

Research on labor market characteristics of immigrants in the U.S. has historically been qualitative in nature. The body of quantitative literature is scarce and focuses on how immigrants fare in the labor market rather than on what effect they have on other labor market participants. In particular, increased immigration may be a response to a strong market for youth labor. An important study in this tradition is Chiswick's (1978) analysis of the earnings of immigrants (as reported in the 1970 U.S. Census). He found that recent immigrants earn less than those who arrived earlier and that after 10-15 years in the U.S., most immigrants earn as much as natives.

Other researchers expand upon Chiswick's work, turning to different data sets, longer time periods, and narrower definitions of immigrant groups. Unfortunately, little attention has been paid to the important question of how U.S. labor markets and, in particular, the youth labor market react to the influx of immigrants. The pertinent empirical question is whether immigrants are substitutes or complements with young native workers.

The scant evidence on this issue is summarized in Table 9. It should be noted at the outset that none of the three studies summarized in the table focuses specifically on the relationship between young workers and immigrants. The results indicate that a ten percent increase in the supply of immigrants has only a very small effect on overall native wages. This does not preclude the existence of an effect on youth, for native age categories have not been separately analyzed.

TABLE 8

Occupational Distributions of Women: Ages 16-29

	1971-1973		1974-1976		1977-1979		1980-1982	
	Percent Female	Occ. Dist.	Percent Female	Occ. Dist.	Percent Female	Occ. Dist.	Percent Female	Occ. Dist.
Profes- sional, Technical	36.21	8.3	38.62	8.6	43.93	9.5	47.39	10.7
Teachers	67.52	6.9	72.16	6.2	73.87	4.7	75.89	3.4
Managers, Admin- istrators	18.10	2.0	23.63	2.6	30.91	3.7	36.87	4.5
Sales	43.71	6.5	48.36	7.0	51.44	7.3	52.63	7.1
Clerical	77.42	39.9	79.83	38.7	81.93	37.0	81.03	37.4
Crafts	3.52	.9	5.18	1.3	5.96	1.4	6.65	1.6
Operatives	32.03	11.2	34.29	10.4	35.16	10.0	34.70	9.0
Transpor- tation Operatives	3.03	.3	4.67	.4	6.66	.5	7.48	.5
Laborers	4.97	.9	6.87	1.2	9.19	1.6	10.62	1.8
Private Household	97.38	4.5	96.27	3.1	96.03	2.5	94.72	2.3
Service	54.21	17.9	56.75	19.5	58.16	20.6	57.60	20.7
Farm	13.33	.8	14.43	.9	20.78	1.1	18.52	.9
	====		====		====		====	
	100.0		100.0		100.0		100.0	

Source: Current Population Survey Data.

tion of women shows, however, that the fraction of women in this occupation rose from just 2.0 percent to 4.5 percent over the same period. In other words, the most impressive percentage gains were made in occupations having small representations of both men and women. These two distinct views of the same data can confound popular beliefs about the changing occupational distribution of women and their potential labor market impacts. While it is true that some shifts are underway (the percentage of women 16-29 who are clerical fell from 39.9 to 37.4 during this period), young women today work largely in the same occupations as they did in the previous decade.

If young men and women are becoming more alike over time with respect to occupational attainment, then these occupations will gradually become more competitive and cause military recruitment prospects to increase, presuming these are occupations that the Armed Forces find desirable. Young women are gradually moving into previously male-dominated occupations. We speculate that this does favor the military recruitment process. However, because the occupational movements are not dramatic in size, the positive impacts on recruitment may be small.

change may have been due to occupational "inflation" brought on by the need to comply with equal employment opportunity guidelines.

5.2.2 The Occupational Distribution of Women

The changing occupational distribution of women presently has an unknown effect on the youth labor market. There are divergent perceptions about the degree to which women are moving into previously male-dominated occupations. Our data show that young women are beginning to make inroads into male-dominated occupations; but, for the most part, these inroads are not that dramatic and are occurring in occupations that are themselves small.

Table 8 shows the occupational distribution of women from 1971 to 1982, using the broadly defined occupational classifications that appear in the Census. The data were calculated by Unicon from the annual March Current Population Survey (CPS) micro-data files. We have divided the classification of "Professional and Technical" into teachers (grade school and high school) and other professional and technical.¹⁵ The data are displayed in two different ways. The first column in each time period shows the percentage of female workers in each occupation. The second column shows the percentage of women who are in that occupation. The data pertain to women of ages 16-29. Two general features are apparent. First, in every occupation, women's representation is increasing; the reason is that women's representation in the labor force as a whole is increasing. The largest gain in terms of representation occurred among "Managers and Administrators", where the percent female rose from 18.1 to 36.9 in only ten years.¹⁶ The occupational distribu-

¹⁵ The data are aggregated into three year intervals in order to increase the sample size and provide reliability.

¹⁶ There is a suspicion among some labor economists that part of this

crease. The relative wage started from a lower level because it includes the wages of all working and nonworking women. By 1980, the relative wage of young working women was approximately equal to the relative wage of all women. This result shows that the labor market for young women was extremely strong during the 1970s, at least relative to that of young men. To return to the original question, these data provide evidence that the rise in participation was due largely to growing labor market opportunities for young women. This acceleration in the wages of women is projected to continue as the high level of labor force participation translates into accumulating labor market experience.

A study by Grant and Hamermesh (1981) investigates whether women and youth are substitutes in production. They find that the wages of young workers decline by 1.5 percent for every ten percent increase in the number of working women. Referring to Figure 1, this result indicates that the demand for youth has shifted to the left, causing wages and employment of youth to decline. Furthermore, as wages decline, there is an excess supply of youth looking for work until the new lower equilibrium wage is attained. The excess supply is consistent with increased unemployment for youth. Youth and women are found to be substitutes in the production process. Therefore, as women continue to enter the labor force in increasing numbers, youth will increasingly look to the military for employment opportunities.

labor force participation rate of 20-24 year old women rose from approximately 57 percent to 70 percent. This large rise in participation was associated with increasing labor market experience for women who were already working, as well as the entry of women with little market experience.

TABLE 7

Female Weekly Wages as a Percent of Male Weekly Wages for Individuals at Ages 20, 25, and 30

Year	Age		
	20	25	30
Sample: Working Women			
1950	83.0	73.2	62.4
1955	86.8	68.1	56.7
1960	88.7	68.3	53.7
1965	92.0	71.0	55.1
1970	73.1	64.6	49.3
1975	72.5	65.5	52.9
1980	74.8	68.3	58.4
Sample: All Women			
1950	71.7	57.5	47.3
1955	75.0	54.2	43.5
1960	78.1	53.8	40.4
1965	81.2	56.4	42.9
1970	67.1	52.7	39.5
1975	67.3	55.3	42.9
1980	75.0	59.4	50.2

Source: Smith and Ward (1984).

When the population of all women is considered, relative wages rose from 67.1 percent to 75.0 percent over the decade, a 12 percent in-

drawing women into the labor force because wages and career opportunities are attractive, or are women seeking work for other reasons? If increased participation is primarily a shift in supply, it will tend to reduce wages and soften the market for youth. Empirically, we observe an invariance in the relative earnings of men and women. Why have women entered the labor force in increasing numbers if their relative wage has remained relatively constant?

A recent paper by Smith and Ward (1984) suggests that new entrants lower the average measured wage. Published labor statistics present the wages and earnings of all working women. There is a tendency to interpret trends in these statistics as trends in the wage of a "typical" working woman. Yet over the last 20 years, women have entered the market with relatively little previous experience and, as the statistics show, relatively less education than previous cohorts of working women. The entry of these relatively low wage women has lowered the average measured wage of working women. This effect is purely a statistical artifact caused by the fact that the aggregate statistics average the wages of working women only.

Smith and Ward construct measures of this compositional effect which are summarized in Table 7. The top panel, showing the relative wage of working women and working men, is the traditional measure of relative earnings. The bottom panel is based on estimates of the relative wages of the population--workers and nonworkers alike. In 1970, for example, the earnings of women relative to men 20 years old was 73.1 percent and it had risen to only 74.8 percent by 1980. During this same period, the

5.2 THE IMPACT OF WOMEN'S ENTRY INTO THE LABOR FORCE

The recent surge in female labor force participation can be analyzed in a number of ways to assess its impact on the youth labor market. First, it must be determined whether the entry of women was an exogenous supply shift (implying a dampening of wages) or the result of an increased demand for their labor (yielding evidence of a strong private sector). We present relative wage data that indicate the latter case to be true. A related issue is whether women have taken private sector jobs away from youth, in which case youth would, to a greater degree, turn to the military in response to their diminished job opportunities. To analyze this issue, we present estimates of the degree of substitutability between women and youth. A separate issue is the impact of female labor force participation on the recruitment of young women. If women are entering occupations that use the same skills as the military, they will view enlistment as an attractive option, assuming pay comparability. We explore the trends in the occupational distribution of women to address this issue.

5.2.1 The Labor Market for Women

An overview of labor market statistics clearly indicates that the market for women, particularly young women, has been growing rapidly. While changes in participation rates and employment ratios indicate convergence between men and women in their degree of labor force attachment, there remains the important question of whether this growth is due to shifts in supply or demand. In other words, is the private economy

TABLE 6

Effect of Ten Percent Increase in Youth Cohort Size on Youth Wages

Study	Years of School Completed			
	8-11	12	13-15	16 +

Tan and Ward (1984):				
Entry Effect	-1.9%	-3.1%	-3.2%	-2.7%
Persistent Effect	-1.3%	-1.2%	-1.0%	-1.5%
Welch (1979):				
Entry Effect	-2.4%	-3.7%	-5.1%	-9.1%
Persistent Effect	-2.5%	-.8%	-1.9%	-2.0%

The major implication of these results for military manpower policy is that the expected decline in youth cohort size, taken by itself, will lead to an improvement in civilian youth employment opportunities and will raise the costs of attracting young persons to the military. While the studies all pertain to the market for men, their implications hold, with even greater force, for women. The available evidence is that, barring any counter effects, declining cohort size will tighten the labor market for both men and women. The youth cohort size effects have already been a focus of concern about future military recruitment. However, there are other trends that have not been introduced into the discussion, many of which may counter the adverse youth cohort size effects.

The peak years occur much earlier for those with higher education. The largest new entrant cohort (29.7 percent) is in 1973 for those with some college, and in 1974 for college graduates (23.9 percent). By 1980, the proportion of new entrants in both schooling groups had shrunk back to levels prevailing in 1967. These earlier peaks may be attributed, in part, to recent declines in progression rates to college--declines that offset the larger baby boom cohorts that could have enrolled in college. This interpretation is consistent with evidence that continuation rates to college peaked in 1969.¹⁴ It is not coincidental, therefore, that the proportion of new labor market entrants with some college education also peaked some four or five years later.

Recent research indicates that this increase in the size of the youth cohort has had a deleterious effect on the wages of that cohort. Much of the literature is devoted to estimating the size of this effect both initially (at the entry level) and over the working life of the youth cohort. The results of two studies are summarized in Table 6, which presents both the "entry effect" and the "persistent effect" for each of four education levels. Both studies indicate that a ten percent increase in the size of the youth cohort lowers the entry wage by at least two or three percent, and lowers lifetime wages by at least one percent. Thus, the size of the youth cohort is a major determinant of the profitability of entering the youth labor market.

¹⁴ It is interesting to note that the peak in continuation rates to college coincides with the end of draft deferment policies.

TABLE 5

Percentage of the Labor Force with 1-5 Years of Experience by Schooling
Category (1967-1980): White Males

Year	Schooling Level Completed			
	Grade School	High School	Some College	College Graduates
1967	9.9	17.1	22.3	18.8
1968	11.5	17.0	22.4	20.1
1969	12.4	17.7	23.7	20.4
1970	14.7	18.5	26.0	21.6
1971	15.6	20.3	27.7	23.2
1972	17.1	20.6	29.1	22.8
1973	17.6	21.0	29.7	23.5
1974	17.5	21.4	27.6	23.9
1975	18.8	21.8	25.9	23.3
1976	19.7	22.3	25.4	22.7
1977	20.4	22.3	24.5	20.8
1978	21.8	22.6	23.0	20.4
1979	22.3	22.3	22.6	18.8
1980	21.5	21.9	21.1	17.4

Source: Tan and Ward (1984), Table 1.

and subsequently dipped back to 21.9 percent by 1980. Since we know the individuals' ages--between 18 and 23--in any survey year we can also determine their year of birth. New entrants in the peak years are easily identified as the baby boom cohorts born in the years immediately preceding the 1961 baby bust.

has fully adjusted or equilibrated. This seems to represent an opportunity for the Armed Forces to more easily recruit the type of talent that best matches their needs. To our knowledge, the quantitative effect of a such a movement, abstracting from any change in the size of the youth population, has not been addressed to date. In the subsections that follow, we discuss a number of different labor market trends, focusing on their potential impact on the youth labor market and the associated effect on the military recruiting environment.

5.1 THE SIZE OF THE YOUTH COHORT

Table 5 is one illustration of the change that has taken place in the experience composition of the labor force over the last two decades. For each schooling group, the table reports the percent of the white male workforce with one to five years of experience (call them "new labor market entrants"). In all schooling groups, the proportion of new labor market entrants increased dramatically over the first half of this period, reflecting the influx of baby boom cohorts into the labor market in the late 1960s and early 1970s, as well as a mild upward trend in participation of those previously not in the labor force.

A turnabout in the entry cohort size is apparent by the late 1970s, particularly for those with a high school degree or less. For those with 9-11 years of schooling, the proportion of new entrants increased from 9.9 percent in 1967 to a peak of 22.3 percent in 1979, and then fell in 1980. Likewise, for high school graduates the fraction of new entrants increased from 17 percent to a peak of 22.6 percent in 1978,

Suppose that exogenous factors suddenly increase the supply of another group of workers--for example, adult women. The supply-demand framework can be used to trace out what happens to the youth labor market as a result of this increased supply of adult women. The effect, however, is ambiguous, as Figure 1 illustrates. As the number of women in the labor force increases, employers adjust their demand for young workers. If employers view youth and women as essentially similar workers (i.e., substitutes), the increase in the number of women will lower the demand for young workers, thus shifting the demand curve to D_s . It is easily seen that the wage of young workers will fall from W_0 to W_s , while employment will fall from L_0 to L_s . This deterioration in the youth labor market can be attributed solely to the assumption that women and young workers are substitutes in production, thus causing the increase in the supply of women to "take jobs away" from young workers.

Youth and women need not be substitutable inputs. Instead they may be complements in production, meaning that the increase in the supply of one input makes the other input more productive. Employers may judge the increase in the supply of women as benefitting youth productivity, and so the demand curve shifts to D^C . The model clearly shows that in this case the youth wage rises from W_0 to W_c , and employment rises from L_0 to L_c .

The inference to be made is that decisions by groups of workers to join the labor force could cause substantive workers (e.g., young men) to experience downward wage pressures, fewer employment opportunities, and longer periods of search (i.e., unemployment) until the labor market

TABLE 9

Impact of a Ten Percent Increase in the Number of Immigrants on Native Wages

Study	Impact on Wage
Borjas (1983): Effect of Hispanic Men on Black Men	Near 0
Effect of Hispanic Men on White Men	Near 0
Borjas (1985): Effect of Hispanic Immigrants on White Men	Near 0
Effect of Hispanic Immigrants on Black Men	- .1%
Effect of Non-Hispanic Immigrants on White Men	+ .3%
Effect of Non-Hispanic Immigrants on Black Men	+ .1%
Grossman (1982): Effect of Immigrants on Native Workers	- .2%

beyond counting algorithms is likely to run into significant obstacles given existing data. The reason is that most economic research on the impact of demographics on the youth labor market uses Census or Census-type micro data. These data files are representative of the population, but are unlikely to provide reliable data on the legal status of immigrants.

Despite the lack of an empirical literature on the effects of illegal aliens, isolated statistics allow tentative conclusions to be drawn. The Department of Labor (1984) estimates that between 3.5 and six mil-

TABLE 10

Occupational Distribution of Immigrants at Entry (1975-1979) and the Civilian Labor Force (1979)*

Occupation Group	1975-1979 Arriving Immigrants ¹	1979 U.S. Experienced Civilian Labor Force ²
White Collar Workers	44.8	49.9
Professional, Technical and Managerial	31.6	25.6
Clerical and Sales Workers	13.2	24.4
Blue-Collar Workers	36.6	33.7
Craft Workers	11.7	13.2
Other Blue-Collar Workers	24.9	20.5
Service Workers	13.7	13.5
Farmers and Farm Workers	4.8	2.8
TOTAL	99.9	99.9

¹/ Select Commission on Immigration and Refugee Policy U.S. Immigration Policy and National Interest Staff Report, April 30, 1981.

²/ U.S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings, January 1981. Excludes persons in labor force who have not been employed.

* Arriving immigrants not in labor force or not reporting occupations are excluded.

Source: Lovell (1982)

lion illegals currently reside in the U.S. with a net inflow of about 500,000 per year; Mexicans account for 60 percent of these numbers. According to Houstoun (1984), "This illegal flow is not only numerically more significant than legal flows, its predominantly low-skilled composition intensifies its impact in a way that is not parallel to legal immigration" (p. 34). There is insufficient data to document the occupational distribution of illegal aliens, but most writers on the subject (Fogel, 1975 and 1977; Houstoun, 1984; Piore, 1975; Wachter, 1980) agree that they are concentrated in low-skilled, low-wage industries--primarily manufacturing, construction, services, and agriculture. This would make them prime candidates as substitutes for youth.

A characteristic of illegal aliens, however, is that they tend to reside in specific geographic areas. Table 11 shows states with the largest number of foreign born inhabitants in 1970 and 1980. California, New York, Florida and Texas--states which are acknowledged to house large numbers of illegal aliens--account for 56 percent of all foreign born inhabitants in 1980. It is unclear how accurate the 1970 and 1980 Censuses were in counting illegal aliens, but these numbers at least lend credence to the belief that illegals are not evenly dispersed geographically. It is tempting to deduce that if illegal aliens are indeed heavily concentrated in these states, the adverse recruitment effect will also be concentrated in these states as well. Even so, these four states account for 28 percent of the U.S. population and 25 percent of total military enlistments in 1984, appreciable magnitudes that cannot be discounted.

TABLE 11

States with the Largest Number of Foreign Born, 1970 and 1980

State	Number of Foreign Born		Percentage Change
	1980	1970	1970-1980
California	3,496,569	1,757,990	99
New York	2,346,478	2,109,776	11
Florida	1,066,482	540,284	97
Texas	845,785	309,772	176
Illinois	837,044	628,898	33
New Jersey	756,407	634,818	19
Massachusetts	483,223	494,660	-2
Pennsylvania	423,839	445,895	-5
Michigan	409,705	424,309	-3
Ohio	296,879	316,496	-6
Subtotal	10,971,411	7,662,898	43
Other States	2,984,666	1,956,404	53
TOTAL	13,956,077	9,619,302	45

Source: U.S. Bureau of the Census, 1980 Census of Population and Housing Supplementary Report, PHC80-S1-1, Provisional Estimates of Social, Economic, and Housing Characteristics (March 1982), Table P-2; U.S. Bureau of the Census, 1970 Census of Population, General Social and Economic Characteristics, United States Summary (June 1972), Table 147. Also see Houston (1983).

In short, the evidence, although fragmentary in nature, indicates that significant numbers of illegal aliens are employed in low-skilled occupations in specific geographic areas. We may logically infer that these aliens are adversely affecting domestic workers for whom they are substitutes--namely, young workers and other unskilled labor. This, in turn, causes military service to become relatively more desirable as an employment option.

5.4 FEDERAL EMPLOYMENT AND TRAINING PROGRAMS

The military is not the only public sector employer of youth. The bulk of federally sponsored employment and training programs impact young people, and the numbers involved are substantial. Table 12 shows the number of people who were CETA (Comprehensive Employment and Training Act) participants (excluding summer programs) from 1975 to 1981. The number of young participants, 21 years old or less, reached a peak in 1976 at 1.1 million, and declined to 0.6 million by 1981.¹⁷ At its height, CETA was absorbing almost as many youth as was the military.

Although not disaggregated by age, the data also show that the fraction of CETA participants with a high school diploma has been approximately 50 percent. There is little doubt that the classroom and on-the-job training provided by CETA job training programs competes directly with the military in the eyes of disadvantaged youth.

¹⁷ Further sharp declines experienced after 1981 were associated with the termination of CETA and its replacement with the Job Training Partnership Act (JTPA). Final enrollment data by age are not available for post-1981. However, total enrollment in CETA fell by 21 percent between 1981 and 1982.

The large effect that CETA had during the late 1970s is now quickly declining. There were 550,000 fewer CETA participants under age 22 in 1981 than in the peak year of 1976 and it seems clear that this trend will continue. To give further perspective on these programs, their total outlays amounted to 28 percent of the entire military personnel budget of \$30.8 billion in 1980. While we know of no studies that have attempted to quantify the impact of these programs on the private sector, reduced participation should serve to further soften the youth labor market. There will be increased competition for available jobs, causing youth wage levels to decline and unemployment to rise. Each of these effects causes military service to become more desirable in the eyes of many youth.

TABLE 12

Number of CETA Participants in Titles I, II and VI by Fiscal Year

(in thousands)

	1975 ----	1976 ----	1977 ----	1978 ----	1979 ----	1980 ----	1981 ----
Total	1,510	2,482	2,361	2,558	2,445	2,019	1,557
Men	872	1,422	1,321	1,405	1,252	996	760
Women	638	1,060	1,040	1,154	1,193	1,023	797
AGE:							
Under 22	782	1,147	924	911	852	763	599
22-44	606	1,113	1,189	1,377	1,325	1,056	827
45 & over	121	223	247	270	264	188	135
EDUCATION:							
Less than HS Grad	655	1,143	945	961	922	826	649
HS Grad or more	720	1,339	1,416	1,597	1,523	1,182	900
RACE:							
White	874	1,452	1,444	1,626	1,287	1,018	786
Black	519	824	726	788	762	671	496
Other	117	206	190	144	396	342	278
Total Minority	636	1,030	917	932	1,158	1,682	774

Source: Employment and Training Report of the President, various years. Some entries are computed by multiplying the reported percentage with a characteristic times the total number of participants, and are subject to round off error.

5.5 TRENDS IN SCHOOL ENROLLMENTS

One of the important characteristics of the youth labor market is the intimate tie between enrollment decisions and labor force participation. Two generalizations are important for understanding this relationship. First, young people who are enrolled in school are less likely to work. Second, the difference between employment rates of enrolled and nonenrolled youth is shrinking over time. That is, the number of youth simultaneously working and attending school has increased, so enrollment rates are not good indicators of labor market attachment.

Tables 13 and 14 demonstrate the extent to which school and work were combined from 1964 to 1979. As Table 13 indicates, the enrollment rates of all 16-24 year olds (black and white, male and female) rose between 1960 and 1969. During the next ten years, however, the enrollment rate of white males fell, while it stagnated or rose very slowly for the other groups.

TABLE 13

Percent of Persons 16-24 Enrolled in School by Race and Sex, Selected Years

	1964 ----	1969 ----	1974 ----	1979 ----
White Men	51.1	56.4	45.9	43.9
Black Men	39.4	47.2	49.0	47.1
White Women	36.5	39.2	39.2	40.2
Black Women	34.2	38.4	41.8	40.2

Source: Bureau of Labor Statistics, published reports.

TABLE 14

Employment Rates for Persons 16-24 by School Enrollment, Race, and Sex,
Selected Years

	1964 ----	1969 ----	1974 ----	1979 ----
ENROLLED -----				
White Men	34.1	41.4	43.8	45.4
Black Men	30.1	29.4	26.4	23.4
White Women	23.3	34.7	40.4	45.4
Black Women	15.4	22.3	18.2	20.6
NOT ENROLLED -----				
White Men	86.7	88.1	85.4	85.7
Black Men	80.5	82.4	72.1	69.8
White Women	47.3	55.1	60.2	66.0
Black Women	48.0	50.7	46.9	43.1

Source: Bureau of Labor Statistics, published reports.

Table 14 shows employment rates for these same groups by enrollment status. There was an increase in the employment rate for white males between 1969 and 1979 due to a combination of falling enrollment and increased employment of students. For black males, employment rates fell for both those enrolled and not enrolled. White women have increased their employment rate dramatically regardless of their enrollment status. The employment rate for all black women fell very slightly.

Overall, falling employment rates do not necessarily imply that enrollment rates have risen, and vice versa. Between 1969 and 1979, the rising employment rate of young white men was partly due to falling enrollment rates, but the increased employment of white women was not. The employment rates of black youth fell without a simultaneous change in enrollment rates.

To the degree that mixed strategies of education and work are an indication of weak school enrollment attachment, these added youth may be more attracted to military service. These issues have yet to be studied thoroughly. This also could suggest that military employers may be at a relative disadvantage in attracting young men and women to the extent that the flexibility of hours offered in the private sector allows education to be combined with work.

5.6 THE IMPACT OF CHANGING TECHNOLOGY

Economic theory has little to offer, and empirical models have even less, regarding the effect of technological change on employment and the youth labor market. Technological advances which save labor (e.g. robots) appear to decrease labor requirements and shift workers to other occupations and industries. A more complex implication is that, as technology is adopted, unit costs of production fall and demand for the product rises (this occurred, for example, with calculators). More units will be produced with less labor per output. Whether the net effect is to decrease labor (because of decreased labor requirements) or to increase labor (due to higher demand for the product) depends on the

magnitude of the demand response to the price decline. This generalized response has not been studied empirically.

Several studies have analyzed the substitutability between capital and labor. Others help to explain why the labor-technology question is so difficult to answer. Most studies which estimate the impact of changes in the demographic composition of the labor force on the demand for young workers use capital as one of the inputs in the production process. This provides an answer, albeit ambiguous, to the question of what happens to the demand for young workers as the capital stock changes. A survey by Hamermesh and Grant (1979) of the early literature on this subject concludes:

"The more human capital embodied in a group of workers, the less substitutable are members of that group with capital. . . . This statement most likely applies to the disaggregation between production and nonproduction labor, as well as to disaggregations by age. Middle-age workers are only slightly substitutable for capital, while youths and workers 45 and over are easily substituted for by capital when their relative price rises" (p. 537).

This conclusion echoes the famous "capital-skill complementarity" hypothesis made by Griliches (1969). Griliches found that unskilled labor (e.g., youth) and capital are easily substitutable, whereas skilled labor and capital are complements in production.

More recent work in this tradition produces empirical findings at variance with the earlier results. For example, Grant and Hamermesh (1981) find that all labor groups, including young workers, are complements with capital. This means that exogenous increases in the capital stock--due perhaps to technological advances--increase the productivity of young persons and increase their wages. Specifically, a ten percent

increase in the capital stock is expected to increase youth wages by 2.4 percent.

It should be noted that this result, which contradicts earlier literature, is extremely tentative. The value of the capital stock in the labor market is, understandably, hard to measure. In addition, an aggregate definition of "technology" is likely to hide major inter-industry differences in the rate of true technological growth. For example, a recent study by Levy, Bowes and Jondrow (1983), which did not focus on the youth labor market, analyzed the changes in labor demand resulting from technological change in each of the following industries: steel, automobiles, aluminum, coal, and iron ore. By understanding the actual production processes, the authors were able to identify specific technical advances in each of these industries. Their main conclusion was that, a priori, it is not possible to predict whether technical change increases or decreases the demand for labor. The direction of the shift depended on the type of invention in the particular industry. Although these results are preliminary and have not been widely replicated for other industries, they provide an important lesson. It is hard to generalize about the impact of technological change on labor demand without defining precisely what technological changes are of interest.

As the capital stock grows in the U.S. economy, it is impossible at this time to generalize about its impact on relatively unskilled youth in the labor market, as well as the effect on military recruitment. Moreover, the capital stock in the military sector is growing as well.

One question that cannot be answered is whether the military is competing for the same kind of talent that the private economy is demanding as technology changes over time.

5.7 THE IMPACT OF LABOR FORCE PARTICIPATION AMONG OLDER WORKERS

The shrinking of the youth cohort is occurring alongside falling participation rates of older men. Figure 2 shows the weekly participation rates of older men (the fraction who are working or looking for work during the survey week). Figure 3 shows the fraction of men who worked at all during the year. Both paths show that the decline in work among older men is not simply a movement to part-time or part-year employment, but represents total withdrawal from the labor market. This decline in work has been occurring not only among those over 65, whose real Social Security and private pension benefits have been rising rapidly, but also among men between 60 and 64 and, to a lesser extent, among 54-59 year old men. A full explanation of this phenomenon is unavailable, but the economic literature points to four contributing factors. The first is the rise in Social Security benefits that amounts to a tax on work and a "bonus" to retirees. The second, less-documented, factor is the rise in the value of private pensions, mandatory retirement and other work rules that encourage early retirement. The third and most likely explanation for the decline in participation of middle age men is the expansion in Social Security Disability Payments. During the last two decades, this program expanded to embrace those with disabilities and younger age groups that had not previously been covered. Finally, the decline in participation of older men has been progressing at least since national

labor force statistics have been measured. The fourth explanation then focuses on the rise in real income and the associated decline in hours of work, whether taken as fewer hours per week, longer vacations per year, or earlier retirement.

This scenario for the period 1984-1993 ignores the potential effects of labor market trends on youth opportunities presented earlier. While we cannot precisely enumerate the total impact of these factors, we are confident that they might sum to as much as 13.5 percent over the nine year period. Part of this confidence is based on the last two findings reported in the previous section--namely, that Army enlistments are rising by about 1.5 percent per year, and that an upward trend in the overall unemployment rate (abstracting from cyclical phenomena) leads to an upward trend in enlistments as well. Accounting for these factors generates a forecast of 51,300 contracts, a three percent increase (see time path DG). This far exceeds the forecast of 30,300 from the perspective of 1979. In addition, none of these future scenarios changes the 1984 levels of pertinent policy variables such as the relative military wage or the size of the recruitment force. Increases in either of these variables could significantly dampen any enlistment contract reduction expected for the coming ten years.

Very similar scenarios can be portrayed for the Army as well. In 1979, Army enlistment contracts of category CAT I-IIIA high school graduates numbered approximately 27,600, relatively few by historical standards. At that time, the outlook for improvement was not bright, again because the size of the youth population was expected to steadily decline throughout the coming 14 years. Abstracting from any positive trend in enlistments, the number of contracts was expected to fall to 26,100 by 1984, and to 23,200 by 1993, representing a decline of 16 percent over the whole period. This scenario and subsequent ones for the Army are depicted in Figure 5; this outlook is represented as time path

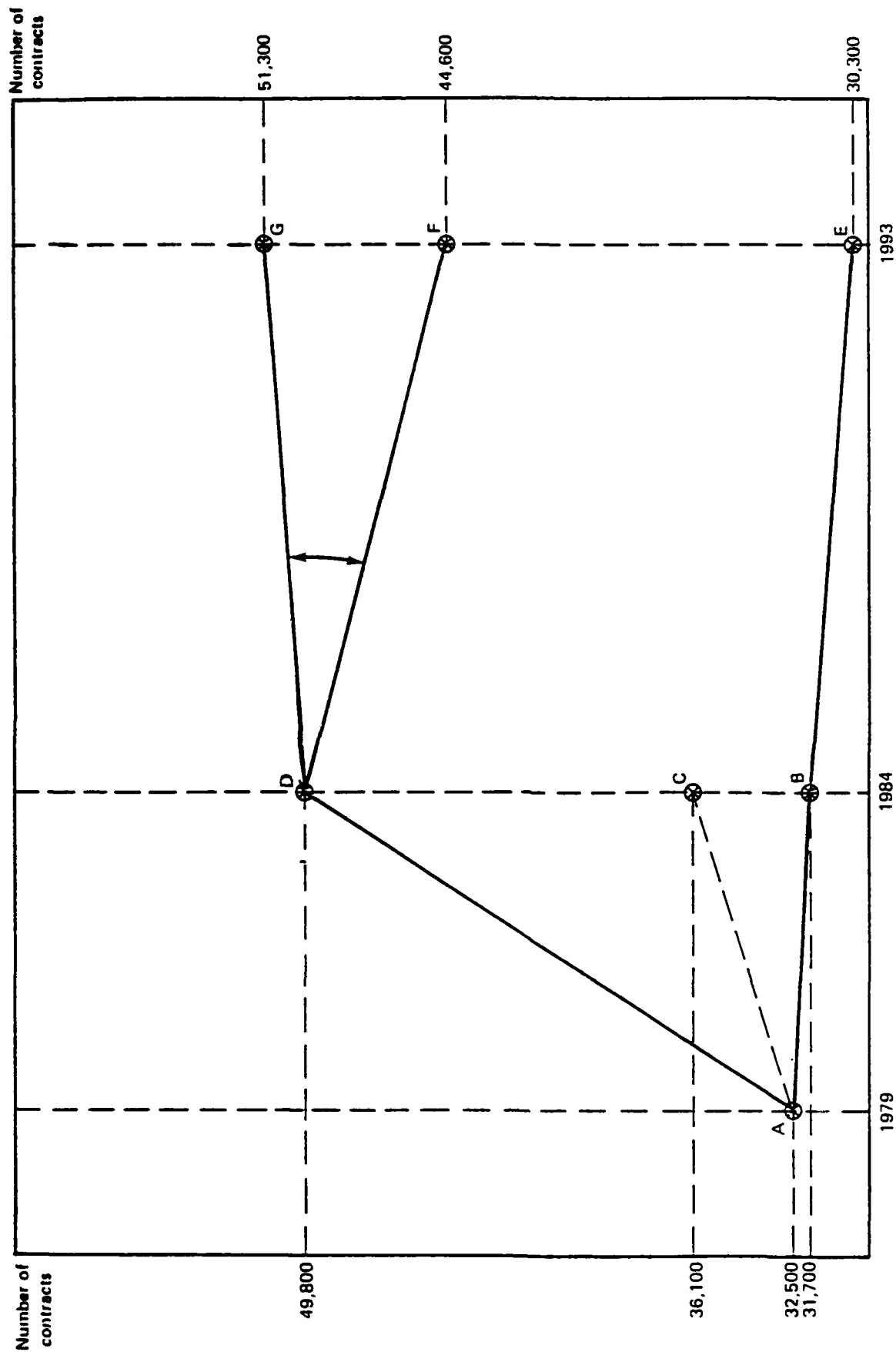


Fig. 4—Outlook for High School Graduate Contracts in AFQT Categories I-III A: Air Force

fall for the next nine years, and the unemployment rate is expected to decline further as the economy fully recovers from the recent recessions. Accounting for these effects leads to the prediction that contracts will decline to 44,600 by 1993--still 37 percent above the 1979 level and approximately equal to the 1982 level, regarded as a banner recruiting year (see time path DF in Figure 4).

Section 7

PERSPECTIVES ON THE FUTURE COURSE OF ENLISTMENT CONTRACTS

In 1979, Air Force enlistment contracts of category I-III A high school graduates numbered approximately 32,500, relatively few by historical standards. From the vantage point of that time period, the outlook for improvement was not bright, as the youth population was expected to steadily decline for the coming decade or more. Using Goldberg-Greenston estimates, the number was expected to fall to 31,700 by 1984, and to 30,300 by 1993; over the whole period, it would have represented a seven percent decline in enlistments. This scenario and subsequent ones for the Air Force are depicted in Figure 4; the outlook as of 1979 is represented as time path ABE in the figure.¹⁹

By 1984, numerous unforeseen events had occurred, including the back-to-back recessions of the early 1980s and a substantially reduced recruiting force.²⁰ Taken together, all of the observed changes between 1979 and 1984 should have yielded a new contract level of 36,100 according to Goldberg-Greenston estimates. In actuality, they rose from 32,500 in 1979 to 49,800 in 1983, a 53 percent increase. From the vantage point of 1984, it is natural to expect, at first thought, that problems loom ahead. The size of the youth population will continue to

¹⁹ To generate predicted values, estimates from the Goldberg and Greenston (1984) model are utilized.

²⁰ All of these events are enumerated in Section 3.

1.5 percent per year, this also amounts to approximately a 13 percent increase over the nine year period, the very same percentage that was calculated from the trend in the overall unemployment rate. These observations suggest the presence of mitigating factors that are counter-acting the effects of the declining youth population size. Quantifying the range of these factors is the subject of the next section.

The impact of changing technology on the youth labor market is indeterminate, partly because the measure of "technology" is rather diffuse. Early studies of this issue tend to conclude that youth suffered from technological change (in which case recruiting benefited). The latest studies tend to conclude just the opposite--that youth benefit from technological change. Studies that look more closely at how production processes have changed over time on an industry-by-industry basis conclude that one cannot generalize how youth are impacted as production processes change.

A fuller study could attempt to complete this taxonomy in order to generate the total impact of general trends in the labor market. This requires both an inquiry into other potential trend determinants as well as a determination of the quantitative impact of each of the general trends. We believe that the total impact is smaller than what is suggested by the youth cohort size effect alone, but this is yet to be substantiated.

It is interesting to note that, during the period 1954-80, the overall unemployment rate grew by 2.2 percentage points, or about 1.8 percent per year. If this trend were to continue for the next nine years (1984-1993), the unemployment rate would rise by 16 percent (abstracting from cyclical phenomena), and enlistment contracts of CAT I-III A HSGs would rise by approximately 13 percent in both the Army and Air Force (using the Goldberg-Greenston and Brown elasticity estimates). It is curious that Brown (1983) found that Army HSG contracts in categories I-III A increased by between 1.2 and 1.8 per year. Using a midpoint of

Older workers have been dropping out of the labor force in increasing numbers and at younger ages. Tighter labor markets for youth could result, even though there is no evidence to document that youth and the elderly are substitutes. However, there is some question about whether this labor force trend will continue. Pension benefit levels (including social security) have been rather generous the last several years, a fundamental factor in the retirement decision. Should these benefit levels decline or become less available at younger ages, the pattern of older workers' labor force attachment could very well reverse and cause a net positive impact on the recruitment effort (if youth and older workers are substitutes).

Our investigation of trends in educational enrollment and changing technology yielded indeterminate directional impacts. While school enrollments of male youth have been decreasing, this trend may be tainted by the draft during the Viet Nam War era. Abstracting from this, enrollment reductions are expected to impact positively the recruitment effort. Our investigation also uncovered a tendency for those youth staying in school to take jobs. At this time, we are unable to ascertain whether this represents a positive or negative impact on enlistments. On the one hand, it could signal a preference by youth to combine work experience and education during the early years of development. On the other hand, it could signal a greater vulnerability of youth in their attachment to educational activities, due either to reduced interest or greater need for income supplementation.

Whether the other trends have positive or negative impacts depends on whether youth are complements or substitutes with the labor category under consideration and on the direction of the trend. Trends that appear to positively impact recruiting success include the rising female participation rate, the surge in immigration, and the gradual reduction in federal employment and training programs. With respect to immigration, we surmise that illegal activity (particularly in localized geographical areas) is having a greater impact on enlistment success than is legal activity, although no formal studies have focused on how legal immigration has impacted the youth labor market. In this regard, it is interesting to note that Grant and Hamermesh find that the increased employment of women ages 25 and over does not impact the wages of men ages 25 and over, but decreases the wages of youth. Immigration may have similar effects; i.e., an increase in immigrants may not impact native adult wages, but may cause native youth wages to decline.

Enrollment in employment and training programs has declined substantially over the past several years and could have had a profound effect on enlistments. Between 1976 and 1981, the total number of job training participants fell by 37 percent; among youth under the age of 22, the decline amounted to 48 percent. Goldberg and Greenston estimate the elasticity of Air Force contracts with respect to job training expenditures to be -0.35. Suppose that job training expenditures fall by 40 percent over the next ten years. The import of this elasticity estimate is that Air Force enlistment contracts (CAT I-III A HSGs) are expected to rise 14 percent--not a trivial amount. A similar impact is expected for the other branches of military service.

these effects is presented in Table 15. The first entry refers to the declining youth population. As this occurs, the civilian wages of youth are expected to rise. The 16 percent fall in youth population size is expected to cause a five to six percent increase in youth wages (see Table 6). This is equivalent to a five to six percent decline in relative military wages (other things the same) and is expected to generate a three to five percent reduction in contracts in both the Army and Air Force, other things the same. Once again, we do not have sufficient information to determine the size of the unemployment rate effect.¹⁸

TABLE 15

Taxonomy of the Effects of Labor Market Trends on Enlistment Contracts

Trend -----	Effects	
	Relative Wage -----	Unemployment Rate -----
Declining Size of Youth Population	-	-
Increasing Number of Women in the Workforce	+	+
Increasing Immigration	+	+
Declining Participation in Job Training Programs	+	+
School Enrollment	?	?
Changing Technology	?	?
Labor Force Participation of Older Workers	?	?

¹⁸ We also ignore here the direct effect of youth population size on enlistments.

Suppose this same trend continues for the next ten years. What impact would this have for military recruiting? A 20 percent increase of women in the workforce is expected to decrease civilian youth wages by three percent, resulting in a three percent increase in the ratio of military to civilian wages, other things the same. Given Goldberg and Greenston's estimate of 0.65 for the elasticity of contracts with respect to the relative wage, Air Force contracts for CAT I-III HSGs are expected to rise by two percent over existing predictions. Given Brown's elasticity estimates ranging from .64 to .97, Army contracts for the same quality group are expected to rise by two to three percent over existing predictions.

The trend of women in the workforce might also impact the unemployment rate in two ways. The first is the direct effect of women causing the unemployment rate to rise. The other is the indirect effect of youth searching for relatively few jobs, causing the unemployment rate to rise. We do not know of any estimates of the elasticity of the unemployment rate with respect to the size of the female labor force. But the process for determining the impact on military contracts would be the same. One would multiply this elasticity times the proportionate increment in female workers (20 percent), and then multiply this product by the estimated elasticity of contracts with respect to the unemployment rate (.85 for the Air Force, and between .69 and .83 for the Army, using the estimates presented in this study).

These calculations can conceptually be generated for each of the general trend factors discussed in the previous section. A taxonomy of

Section 6

METHODOLOGY FOR MEASURING THE IMPACT OF LABOR MARKET TRENDS ON ENLISTMENT CONTRACTS

In the previous section, we discussed the finding that youth and women are substitutes in production. Given the dramatic increase in the labor force participation rate of women, one infers that wages and employment opportunities of youth have diminished from what they would have been. Using the analytical structure of Figure 1, the demand for youth has shifted down and to the left as a result of the bulge of women entering the workforce and substituting for youth. At the old equilibrium wage, the quantity supplied is greater than quantity demanded, a situation referred to as one of excess supply. Two dynamic processes result. Youths compete for jobs by lowering their wage requests, and youth unemployment rises during the time that the wage is falling to its new equilibrium level.

During the period 1969-1979, the employment level for men grew by 18 percent. In 1969 the employment level for women was 29.1 million. If employment for women had grown at the same rate as for men, there would have been 34.3 million women workers by 1979. The actual number in 1979 was 41.2 million, 20 percent higher than the projected number. Recall that Grant and Hamermesh (1981) estimated the elasticity of youth wages with respect to female employment to be -0.15 . Consequently, the 20 percent surge of women into the workforce is estimated to have depressed youth wages by three percent relative to what they would have been.

Given the recent 1983 amendments to the Social Security Act and the growing sense of austerity in Congress, it seems highly unlikely that the first three sources of the decline in participation will continue. Real Social Security benefits have remained fairly stable for the last few years; as the new amendments take hold, they will decline. The tightening of eligibility for Social Security disability will also act to reverse this trend for middle-age men. Thus, while the total effect on the size of the male labor force is uncertain, the direction of the policy effects is clearly to arrest the decline in male participation. Furthermore, the number of individuals in this labor force group will be growing over time. To the degree they are substitutes for youth, they will dampen the adverse effects of the declining youth population size on military enlistment contracts.

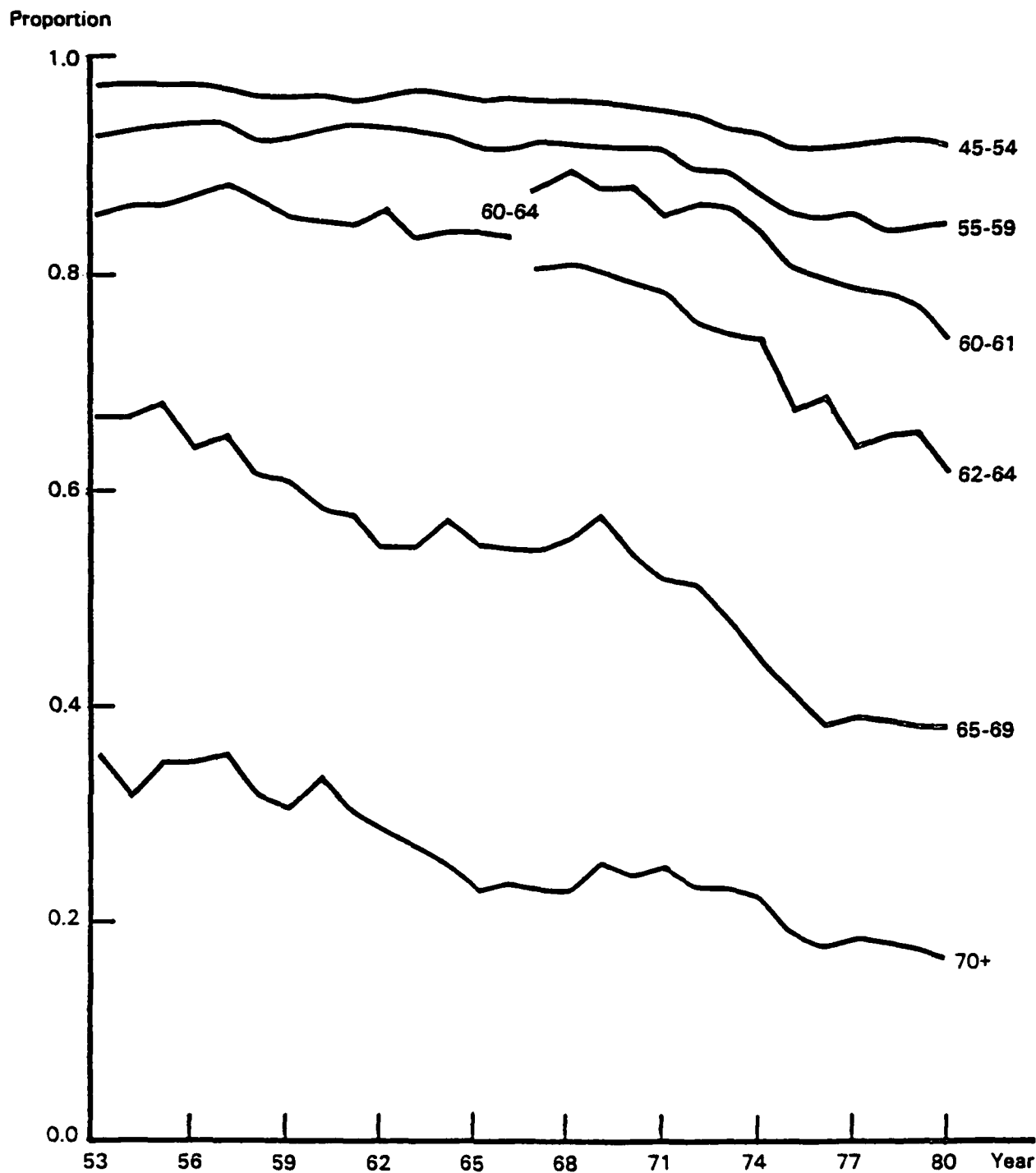


Fig. 3 — Percent of Men with Work Experience During the Year
By Age Category

Source: Ward (1984)

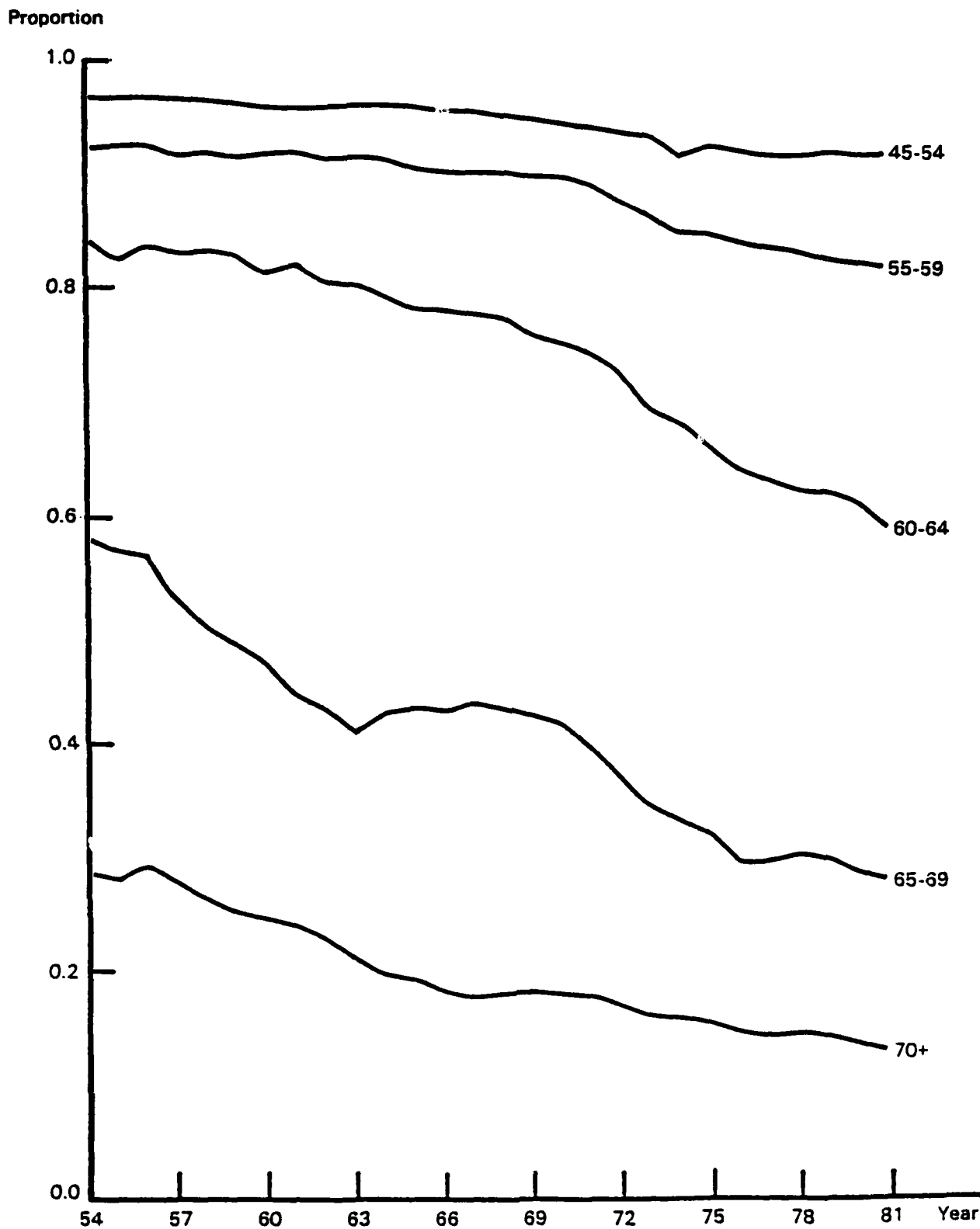


Fig. 2 —Weekly Labor Force Participation Rates for Men
By Age Category

Source: Ward (1984).

ABF in the figure. In Brown's model, however, enlistments of CAT I-III A HSGs are found to trend upward by as much as 1.8 percent per year. Taking this into account, one generates a time path of ACG in Figure 5; by 1993, contracts would be 30,200, representing a nine percent increase over the 1979 level.

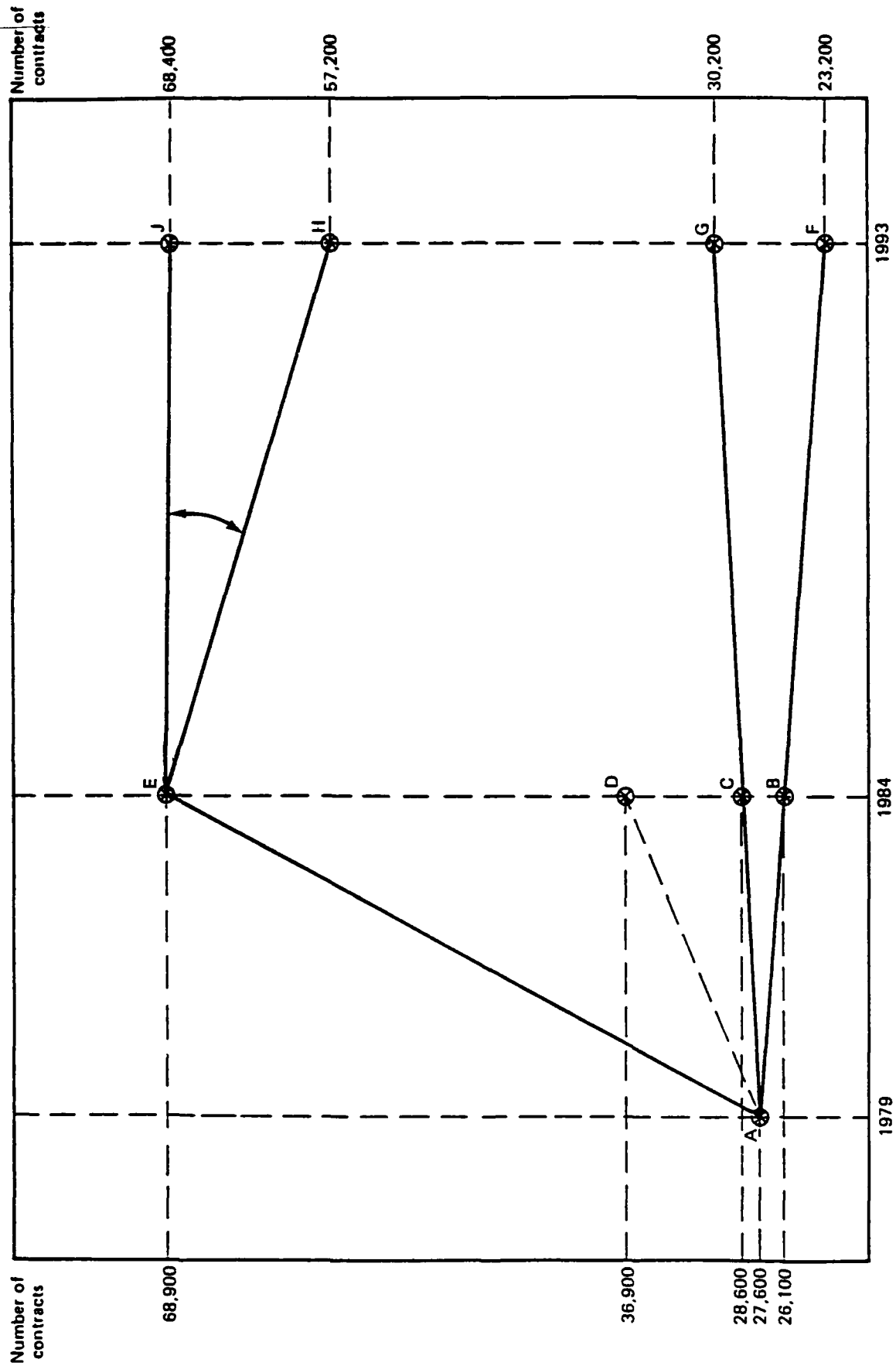


Fig. 5-- Outlook for High School Graduate Contracts in AFQT Categories I-III A: Army

By 1984, Army enlistment contracts had risen from 27,600 to 68,900--a 250 percent increase. Even incorporating the positive enlistment trend in Brown's model only predicted a level of 36,900 for 1984, given the changes that were observed for the 1979-1984 period (see Section 3). From the vantage point of 1984, the number of contracts is expected to decline only to a level of 57,200 over the next nine years as the size of the youth population and the unemployment rate fall further. Accounting for the positive trending effect would suggest only a very small decline from 68,900 in 1984 to 68,400 in 1993. Thus, enlistment levels between points H and J are anticipated for 1993--still more than double the level observed for 1979 and approximating the level observed for 1982.

Taken in historical perspective, the upcoming declines in the size of the youth cohort should not come close to threatening the viability of the all volunteer military. Indeed, recruitment during the first part of the 1980s represents a story of success. If 1993 is projected to be the worst year on the horizon, the success of the all-volunteer military should not be in question.

Section 8

AN EVALUATION OF ENLISTMENT METHODOLOGIES

Assessing the prospects for future enlistments requires confidence in the enlistment modeling framework and the estimated elasticities they produce. Improved performance can only be achieved by periodically reviewing the methodology used in existing state-of-the-art models. In this section, we call attention to a number of issues that should be addressed in order to increase confidence in the useful application of enlistment models.

8.1 MODEL STRUCTURE AND ENDOGENEITY

Most applications of enlistment models are directed at supply considerations; i.e., determining how many contracts the military can expect to obtain for a given set of circumstances. The data that are observed over time are influenced by other factors--in particular, demand considerations. Manpower requirements by the military can either shrink or fail to keep up with supply during certain time periods. Consequently, using these data in an enlistment model and interpreting the results from a supply perspective is inappropriate due to the demand contamination.

In an effort to purge demand influences, Goldberg and Greenston (1984) limit their sample to years they judge to be tight recruiting

years. But this requires an a priori judgment that not all investigators would agree on. Other researchers focus exclusively on high quality enlistee distinctions when trying to examine supply responses, with the presumption that the military always takes as many "high quality" enlistment contracts as possible, filling in the remainder of their aggregate goals with what may amount to an excess supply of lower quality enlistment contracts.²¹

An alternative to these approaches is to build a model with explicit demand and supply elements that utilizes data for all available time periods. Statistical methods can then be used to separate demand influences from supply influences so that separate effects can be identified. This is the direction taken by the DeVany-Saving (1982) model. Contract goals are specified in the model to directly impact the quality ratio and mean wait time; these variables in turn affect total enlistment contracts. In this model, the contract rate, quality ratio, and mean wait time are termed endogenous variables because they are affected by both supply and demand factors and are not predetermined outside of the model structure.

Another example of endogeneity relates to models that use the youth unemployment rate as a cyclical indicator (see Ash, Udis, and McNown, 1983). In considering the impact of a ten percent increase in the youth unemployment rate on the enlistment rate, it is natural to act as if the increase in unemployment were an exogenous, causal influence. But causation between unemployment rates and enlistments could run both ways.

²¹ The Brown model (1983) is in this vein.

An increase in the unemployment rate generates an increase in enlistments, but an increase in enlistments reduces the supply of labor to the civilian market and thereby lowers the unemployment rate.

Recent work by Dertouzos (1984) suggests that recruitment quotas have been instrumental in the recent recruitment success of the Army. Here again, however, a question arises about whether quota variables "explain" enlistments in a causal sense or whether these variables simply reflect past recruiting success used to formulate quotas. To the extent that recruiters do respond to quota-related incentives, these incentives could be an important policy tool for the future. But the casual link first must be established using statistical procedures.

8.2 ROBUSTNESS OF MODELS OVER TIME

In our selection of two Air Force enlistment models, we found that one performed better than the other in explaining the 1979-1983 changes in enlistment contracts. The "better" model was estimated for the period 1978-1981--a larger overlap than the other model, which was estimated for the early 1970s. A question arises as to whether the "better" model would perform well for other time periods, either future or past. The state-of-the-art may be such that no model is very robust across time periods. This represents an important consideration worthy of research attention.

8.3 USING CROSS-SECTION VERSUS TIME-SERIES DATA

Studies of enlistment contracts have used many different kinds of data: purely cross-sectional data, purely time-series data, and time series of cross sections. The major advantage of data with a cross-sectional dimension is that they typically exhibit more independent movement in key variables and, consequently, effects appear to be estimated with greater precision. There are, however, a number of potential problems with cross-sectional data that have not been fully appreciated, or at least not sufficiently emphasized, in previous work.

One possible problem is that time-series variation in a variable may have a different underlying interpretation than cross-sectional variation. That is, the variation may be due to different causes. This distinction could be important if estimates derived from the data are used to forecast the future path of enlistments. In the absence of evidence to the contrary, one assumes that whatever caused a variable to evolve over the recent past will also cause the variable to evolve in the future. Thus, time-series variation in the past is generally useful in estimating the effect of future changes in enlistment determinants. If cross-sectional variation is of a different nature, it may not be as useful in forecasting what will happen over time.

For example, variation in unemployment rates in cross-section may have a different interpretation than in time-series. Unless explicitly controlled for elsewhere in the analysis, cross-sectional variation can arise from changes in the extent of unionization, differences in the industry mix within an area (temporary layoffs are much more common in

some industries than in others), or differences in the demographic composition of the labor force. These same factors are unlikely to account for much, if any, of the time-series variation in unemployment rates, at least over the relatively short period of time spanned in most studies of enlistment supply.

This issue can be critical when using a model for forecasting. For example, if the national unemployment rate is expected to fall over the next several years, a model based solely on cross-sectional data can yield a prediction based only on observed variation of unemployment rates in cross-section (e.g., states). The cross-sectional units may have different unemployment rates for reasons related to business cycles, but there are also the other reasons for differences in unemployment rates. Care must be taken so that biased predictions do not result because of a data dimension issue.

8.4 DIFFERENCES IN MODEL SPECIFICATION AND FUNCTIONAL FORM

In addition to differences in model structures, there are differences in how the relationships are specified and what functional forms are imposed on the specifications. One example of this is the novel specification used by Goldberg and Greenston, who enter youth population as a separate determinant rather than as the more standard deflating variable. In this instance, it turns out not to matter because the estimates are not appreciably impacted.

Another example of specification concerns the fact that military pay raises are generally known prior to the time they take effect, giving

rise to the possibility of lead effects in enlistment behavior. Recognizing this possibility, Dale and Gilroy (1983) use a four-month lead in their pay variable. One must be concerned that this lead is picking up a spurious correlation between increase in military pay, which generally occur in the beginning of October, and the surges in enlistments that accompany the close of school in early summer. When models diverge in specification and/or functional form, the causes of any differences in estimates must be scrutinized.

8.5 LEVEL OF AGGREGATION CHOSEN FOR DETERMINANT VARIABLES

In general, the appropriate statistics to include in an analysis of nonprior service enlistments are those applicable to youth--e.g., youth unemployment rates and civilian youth wages. But there is often a tradeoff between using the appropriate statistical aggregates and data reliability and/or data endogeneity. The advantage of a youth-based series is that it focuses on the prime enlistment candidates and may therefore be more relevant conceptually.²² On the other hand, youth wage series are typically based on much smaller samples of workers than are more broadly based series at the same level of geographic detail, and hence measurement errors are a more serious problem. In addition, endogeneity is more likely to be a problem with a youth wage series. Finally, it is difficult to interpret youth wages as representative of fore-

²² It is worth noting that when civilian pay is entered logarithmically, as is frequently done, the correct pay elasticity can be obtained from a more broadly based pay series as long as that series remains proportional to the correct youth pay series. While the decline in the size of youth cohorts will eventually make the proportionality assumption untenable, evidence from Tan and Ward (1984) suggest that this assumption is not unreasonable for the mid-to-late 1970s.

gone earnings for a typical young person because large fractions of youth are working at part-time jobs or are enrolled full-time in school.

8.6 LABOR MARKET BAROMETERS AND CYCLICAL DISTURBANCES

In general, the overall unemployment rate is used to gauge the economic conditions in the labor market. The source of official labor force statistics, including the unemployment rate, is the Current Population Survey (CPS). This is a monthly survey of approximately 60,000 randomly selected households throughout the country. Based on responses to the survey, the Bureau of Labor Statistics (BLS) classifies individuals age 16 or older into three groups: employed, unemployed, or not in the labor force.

Individuals are classified as employed if they worked at least one hour for pay or profit or at least 15 hours without pay in a family, farm or business enterprise during the week prior to the survey. Individuals who were not working but who had jobs or business from which they were temporarily absent because of illness, bad weather, vacation, labor-management disputes, or personal reasons are also classified as employed. Individuals are classified as unemployed if they did not work during the week prior to the survey, but made specific efforts to find a job sometime during the previous four weeks. Also included among the unemployed are: (1) persons not looking for work because they were laid off and waiting to be recalled, and (2) persons expecting to report to a job within 30 days. Individuals are classified as not in the labor force if they are neither employed nor unemployed.

The BLS then estimates and reports the number of individuals who are employed, unemployed, or not in the labor force each month. Three common summary measures are often used to gauge the performance of labor markets. The unemployment rate measures the proportion of those individuals willing to work who are actively seeking work. It is formally defined as the percentage of the civilian labor force (those either employed or unemployed) who are unemployed. The employment ratio measures the proportion of the civilian noninstitutional (i.e., not in prisons or hospitals) population under consideration that is employed. The civilian labor force participation rate is the percentage of the civilian noninstitutional population under consideration that is either employed or unemployed.²³

Of these three measures of labor force activity, the unemployment rate receives the most attention. There are drawbacks to using the unemployment rate alone as a barometer for labor force activity, especially when comparing rates across demographic groups or over extended periods of time. An unemployment rate provides no indication of the intensity with which individuals have sought work. Individuals who have engaged in intensive search for jobs by contacting many potential employers, perhaps through private or public employment agencies, are counted the same as those who have casually inquired about potential jobs by asking friends or relatives or by scanning newspaper ads. Simi-

²³ These summary measures are easily defined with algebraic expressions. Let E represent the number of employed persons, U represent the number of unemployed persons, and P represent the size of the civilian noninstitutional population. It follows that the employment rate is E/P , the unemployment rate is $U/(E+U)$, and the labor force participation rate is $(E+U)/P$.

larly, those who have continuously sought full-time employment are counted the same as those who have searched only intermittently for part-time jobs. Heads of households are treated in the same way as youth living at home. While some individuals may search rather casually because they are not that interested in working (or are being particularly selective), others may do so because they are discouraged about their prospects for finding work. While the latter individuals are counted as unemployed, those individuals with similar circumstances who did not bother to even casually search are counted as not in the labor force. Because of these phenomena underlying the tabulated statistics, care must be taken in their interpretations.

In recent years, almost half of the unemployed at any point in time are youth between the ages of 16 and 24, even though this group accounts for approximately 20 percent of the population aged 16 and over. Teenagers (youth between the ages of 16 and 19) account for half of total youth unemployment (ages 16-24).

Youth labor market statistics are particularly difficult to interpret. For young men and women making the initial transition into the labor force, shopping for good job matches, and transiting between unemployment, employment and withdrawal from the labor force, the official statistics can often be misleading. This is particularly true of unemployment rates. As mentioned in the previous page, in order to be counted as unemployed, it is only necessary to look for work. The type of work, the desired number of hours of work and the intensity of search is not relevant. A casual inspection of a school bulletin board counts as much as presenting oneself to an employment agency.

Some additional statistics illuminate this interpretation problem. While teenagers account for approximately one-fourth of all unemployment, around 70 percent of teenagers are in school. Of those in school, less than one percent are unemployed and seeking full-time employment; approximately seven percent are unemployed and seeking part-time employment. Of the 30 percent of teenagers not in school, around 16 percent are unemployed. But this represents only five percent of the teenage population given that most teenagers are enrolled in school--i.e., only five percent of teenagers are both out of school and unemployed. Thus, the distinctions between unemployment, employment, and out of the labor force would seem to be less distinguishable, at least relative to the status of adults.

This lack of distinction among the three labor force states also complicates comparisons over time. Between 1969 and 1979, two relatively prosperous years, the unemployment rate of 16-19 year old men rose from 11 percent to 16 percent. Such a statistic would normally be interpreted as a deterioration of the labor market. However, over the same years the employment ratio rose from 64 percent to 67 percent. With a higher fraction of the population employed, this second statistic would normally indicate an improved labor market. For 16-19 year old women, the unemployment rate rose from a little over 13 percent to over 16 percent. At the same time, the fraction of women 16-19 who were employed rose from 45.5 percent to 54.5 percent. The ability of the labor market to absorb this kind of growth in employment with relatively small rises in unemployment suggests that, in this case, the rise in unemployment was more indicative of labor market indigestion than of any broadly conceived deterioration in conditions.

8.7 ASYMMETRY AND SATURATION ISSUES

Analysts generally assume that coefficients on business cycle variables are constant over the cycle, but it may be that the same change (or percentage change) in the unemployment rate has a different impact on enlistments when the economy is in a recession than when the economy is in an expansion. That is, effects of changes in unemployment rates may differ depending upon whether the unemployment rate is above or below trend. Such a difference could arise if high-quality nonprior service males have different cyclical unemployment patterns than the reference group for the unemployment rate measure. In addition, the effect may vary with the direction in which the unemployment rate has been headed in the immediately preceding time periods: a movement in the unemployment rate from, say, eight to nine percent may have a different impact on enlistments if the economy has previously been improving than if the economy has been sliding. The source of this difference is the anticipations formed on the basis of the sequence of unemployment rates. When unemployment rates have been rising, an additional increase is taken as confirmation of the trend. On the other hand, when unemployment rates have been falling, a single increase may be taken either as an aberration or as a warning. Because of this difference in interpretation, one would expect differences in the resulting enlistment response.

Another unresolved issue that is potentially important in light of the anticipated decline in youth population size is the saturation question. It is sometimes thought that because recruiters do not contact every member of the youth population, some reduction in the youth popu-

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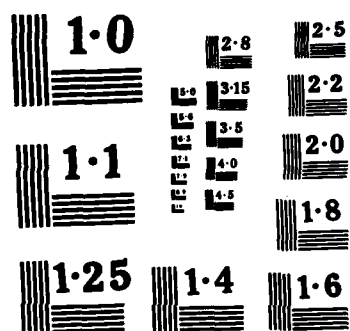
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lation can occur without a resultant reduction in recruiter contacts and, consequently, without a reduction in enlistments. Similar logic suggests that once recruiters have saturated the labor market (i.e., are "in touch" with the total youth population), further increases in recruiters will have much smaller effects on enlistments than if the market were not yet saturated. These arguments imply that recruiter effects and population effects change at the saturation point. Although the saturation issue has been recognized in the past, we have not seen a framework that explores estimation of the discontinuities it implies. Hence, we cannot assess whether the argument has empirical validity, and it remains an open issue.

8.8 TREND IN AIR FORCE ENLISTMENT CONTRACTS

Brown's (1982) finding of a 1.2 to 1.8 percent increase in high quality Army enlistments every year is a provocative result. A similar analysis should be attempted for the Air Force. Also, seeking explanations for this finding is in order. Candidates include youth attitudes toward military service and the effects of other general labor market trends on enlistments.

It is sometimes alleged that a major attraction of the services is the on-the-job training that may be carried into the civilian sector when the term of enlistment is over. Although we have not yet seen a projection model that explicitly takes account of changes in the training content of military jobs, future enlistments could be heavily influenced by this aspect of military life. If, for example, an increasingly

large fraction of military jobs provided training in computer skills that were transferable to the civilian sector, one would expect a concomitant increase in enlistments. An investigation of such possibilities deserves a prominent place on the agenda for future research.

8.9 GENERAL CONSTRUCTION OF SELECTED VARIABLES

In computing military and civilian pay, some researchers have looked at only the first year of enlistment and employment, respectively, while others have considered present discounted values of income streams over a three or four year period. Assumptions about discount rates and rates of civilian wage growth have varied substantially. It is our impression, however, that estimated pay responses are not very sensitive to these various methods of computing relative wages. Regarding the level of military pay, analysts have typically focused on Basic Military Compensation (BMC) or Regular Military Compensation (RMC) in the lower enlisted grades.

Most analysts have used a single pay variable to reflect the ratio of military to civilian wages (Cooper, 1977, and Brown, 1983, offer alternative specifications). The assumption that only relative pay matters may not be correct, but as a practical matter it may be very difficult to estimate separate military and civilian wage effects with the limited amount of variation available in military wages, particularly if lag or lead effects are to be estimated as well. There is near unanimity in the belief that the extent of educational benefits offered to recruits positively affects the number of enlistments. The relatively generous

G. I. Bill was more attractive to potential enlistees than the current Veterans Education Assistance Program (VEAP). This fact is evident from the results of the existing literature. Less is known about the effects of the Army's VEAP kickers and the special programs that were part of the Educational Assistance Test Program (EATP) and the Multiple Option Recruiting Experiment (MORE). Some work along these lines has been done by Brown (1983) and by Dale and Gilroy (1983), but the major source of information on these programs remains the experimental results themselves (see Fernandez, 1982, Fernandez and Polich, 1982, and Haggstrom, et al, 1981). An interesting issue to pursue is whether a dollar worth of educational benefits generates the same enlistment response as a dollar in added income to enlistees. Brown (1983) finds that educational benefits generate a much larger response. The should be investigated further.

Analysts have generally found positive effects of national advertising (see, for example, Brown, 1983). However, estimates of the effect of local advertising are generally small and often negative. One cannot infer that local advertising is not an important policy variable that enhances enlistment contracts given current research estimates. This result probably represents another decompositional problem associated with the use of cross-sectional data. It is possible that relatively high expenditures are targeted to areas with historically low recruiting success. Thus, even if these expenditures are positively affecting enlistments in the area over time, their impact appears negligible, or even negative, when a cross-sectional snapshot is utilized. Furthermore, these local expenditures are often deflated by the reference popu-

lation under consideration. This would deny economies of scale within dense populations. For example, enlistment success may be high in a densely populated area, but it is associated with a low per-capita advertising expenditure due to density considerations.

Section 9

CONCLUSION

The purpose of this report has been to examine the effects of labor market trends on youth employment opportunities and military enlistments, and to review the determinants of enlistment contracts and related methodological issues. Some analysts are projecting that the volunteer military is not assured of survival despite its recent success (see e.g., Binikin, 1984). These analysts attribute the success of the early 1980s solely to military pay raises, intensified recruiting efforts, and depressed civilian labor market opportunities that more than compensate for the gradual reduction in the size of the youth population. Since the size of the youth cohort will continue to decline for approximately eight more years and the economy is now rapidly recovering from its depressed state during 1980-1982, some are calling for a reconsideration of peacetime conscription or dramatic changes in military manpower policies designed to relieve pressures on the need for male recruits.

There is no question that the size of the male youth cohort is diminishing over time and that this trend does not aid military recruitment. However, we have identified other trends in the labor market that counter this adverse effect. Namely, increases in the labor market participation of women, increases in immigration (legal and illegal), and decreases in public job training opportunities should mitigate the unfavorable effects of youth cohort size on military recruitment. But

even abstracting from these positive effects on enlistments, the recruitment success of the Armed Forces has been so pronounced during the past five years that the projections of the statistical models do not call for circumstances that approximate the conditions experienced in 1979.

Our lowest projection for 1993, the year that the size of the youth population ages 17-21 reaches a minimum, puts enlistment contracts of CAT I-III A HSGs at a level that is 37 percent above the 1979 level for the Air Force and more than double the 1979 level for the Army. Relative to 1984 levels, among the highest in the history of the all volunteer military, these projections represent a ten percent decline in contracts in this category for the Air Force and a 17 percent decline for the Army. However, the low projection paths take account of only reductions in youth cohort size and unemployment conditions. Other labor market and attitudinal trends should mitigate these low projection paths appreciably. For the Air Force, we project that enlistment contracts might rise by three percent by 1993. For the Army, contracts might fall by only one percent. In our view, the outlook for the volunteer military is not bleak, but bright. Even if some declines occur in the recruitment of quality youth in the coming years, they will not approach the conditions experienced in 1979, but instead approximate the circumstances experienced in 1982, regarded as a banner year for military recruitment.

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